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THE ENHANCED, INTEGRATED SOLDIER SYSTEM ON JANUS (ARMY)

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The purpose of this report is to document the results of our analysis concerning The Enhanced Integrated Soldier Systems (TEISS). Our analysis was conducted in two phases. The first phase consisted of an examination of equivalence between TEISS and conventional platoon. The second portion of the analysis built on the results of the first by attempting to validate the TEISS equivalency number and to conduct a trade off analysis on two weapon systems that are presently being developed by the Army.

To conduct the first portion of the analysis, we selected a conventional platoon-size element with which to compare the TEISS soldiers. We conduct our simulation in a raid scenario, with a light Infantry platoon raiding a drug processing plant.

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TEISS Stage I COEA

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EXECUTIVE SUMMARY

The purpose of this report is to document the results of our analysis concerning The Enhanced Integrated Soldier System (TEISS). Our analysis was conducted in two phases. The first phase consisted of an examination of equivalence between TEISS and a conventional platoon. The second portion (Found in the Appendum of this report) of the analysis built on the results of the first by attempting to validate the TEISS equivalency number and to conduct a trade off analysis on two weapon systems that are presently being developed by the Army.

To conduct the first portion of the analysis, we selected a conventional platoon-size element with which to compare the TEISS soldiers. We conducted our simulation in a raid scenario, with a light Infantry platoon raiding a drug processing plant. After drafting the scenario on Janus(A), we modeled conventional soldiers, TEISS soldiers, and their weapon systems in Janus (A). Our conventional soldier was modeled with guidance from Army Field Manuals and common sense, while the TEISS soldier was modeled to reflect the TEISS system's project goals and other information from the White Sands Missile Range, the Dismounted Battle Laboratory, ARDEC, and NATICK.

Our simulation runs, in Phase I, sought to establish a point equating the lethality and survivability of a conventional platoon as compared to a TEISS section. Our

analysis in this area revealed that thirteen TEISS soldiers equal the lethality and survivability of the conventional 34 platoon.

After finding the equivalency point, we began the Phase II of our analysis, the validation of our thirteen man equivalency figure and a trade off analysis on the Track-Box sight and the Objective Infantry Combat Weapon (OICW). Simulations in phase II utilized a new scenario, with the major engagement consisting of an ambush of fleeing drug cartel henchmen. These simulations, through the full factorial design analysis, showed that the thirteen man force is not truly equivalent to a conventional platoon due to scenario dependence. Second, the OICW is a significantly better weapon than the Track-Box sight in the hands of both the conventional soldier and the TEISS soldier. And finally, the TEISS soldier, as he is planned is a extremely lethal weapon whose technology and abilities out distance our conventional tactics. We recommend further development in these areas to ensure that accurate trade off analyses are performed in the future.

I. The Acquisition Issue:

The first section of the COEA establishes the basis for the analysis of the TEISS system. This section clearly demonstrates the need for the system, the environment that the system will operate in, and other information that will guide the analysis of the TEISS system.

A. The Need

The basis of warfare throughout the ages has been based on the individual fighting abilities of the infantryman. The infantryman that can hold his ground and wrestle the enemy's territory from him, will win any type of conflict. Recent technologies have drastically increased the lethality of combat systems, but these increases have more often than not fallen to non-infantry weapons. The individual soldier is still fighting at the same technological level as his predecessors were in World War II.

Recently the Army has placed emphasis on the individual infantryman, the weapons that he uses and the equipment that enhances his lethality and survivability. As a result, many different agencies have begun development of equipment for the future TEISS soldier. Our study was conducted to take these present systems and some of the near future systems equipment and evaluate them as a whole. This analysis was conducted to act as a basis for all further studies on the

TEISS equipment that the Army's research laboratory will undoubtedly develop.

B. The Threat

As the Army moves in to the 21st. Century, it will be called on to complete a host of missions that planners would have never dreamt possible a few years ago. The cold war has ended, yet the need for the Army has stiffened. The loss of the Soviet Union has seriously eroded the balance of power in the world, and as a result the world is plagued with civil and border wars. In addition to the Soviet breakdown, the rise of illegal narcotics trade and its long-term effect on the U.S. have made the Narcotrafficers a serious national security threat. Any of these concerns represent possible missions for our future Army.

These contingencies call for missions that depart from the counter-Soviet mechanized warfare that has consumed our army for the last forty years. These new missions more than likely fall into the category of low-intensity conflicts that demand the use of infantrymen. And in our present era of military budget cutting, these missions will have to be accomplished with fewer and fewer men and resources.

C. Environment

As the world continues to become less orderly and conflicts spring up around the globe, it becomes very difficult to determine where the TEISS operating environment

will be, or who he will face in combat. There is however a specific combat environment that has supported offensive operations and will undoubtedly do so again. This area is Central and Northern South America .

Central and Northern South America ~~is~~ are vital to the future of the U.S. because of its role in the illegal flow of drugs into the U.S.. This area was the site of anti-drug operations in the 1980's and will probably support combat operations again. This area of the globe also serves as a good place to evaluate the TEISS soldier, because of the harsh climate and rugged terrain.

The TEISS system will be evaluated in a mission setting that is extremely challenging. The mission takes place in a very mountainous region, filled with river and pond obstacles and thick tropical foliage. This environment serves as an excellent place to evaluate the TEISS soldiers Line of Sight (LOS) capabilities, movement capabilities, and mission flexibility.

D. Constraints

In order to conduct an equality analysis, we were constrained in two major areas; weaponry, and tactics.

In the area of weaponry, there were a few limitations that limited the scope of the test. First, both the conventional soldier and the TEISS soldier used the same conventional weaponry (those found in today's Army platoons). This was done so that the TEISS would not benefit from the enhanced killing and incapacitating

capability of his near-future weapon, the OICW. This study is concerned with testing the effects of this advanced weapon. Second we modeled the M203 grenade launcher as an indirect fire weapon. This allowed the M203 to be used as a direct and indirect grenade firing weapon while maintaining the ability of the operator to fire the M16A2 host weapon. Because of the indirect firing capabilities of the M203 and the Janus(A) model, the M203 was able to add to the effectiveness of the mission by suppressing the enemy and ruining his visibility by using smoke rounds to obscure the path of the assaulting forces. Third, we did not use any mines, chemical weapons, or rocket propelled grenades. We believe that it is very unlikely that the guards at a cocoa processing plant would have any of these capabilities. Finally, we did not use any aviation assets for close air support or use any artillery for fire support. The stealthy hunter/killer platoon in our hypothetical scenario would not realistically have these assets.

The second area, of the analysis that involved limitations, was the use of duplicate conventional tactics. There are two primary reasons why conventional tactics were used. First, as with the near-future limitation, we are more interested in the direct substitution of the TEISS soldier into the role of the conventional soldier. By allowing TEISS to operate with different tactics, the comparison would lose its credibility. Second, no one has really developed a set of tactics for the TEISS system,

because no one really knows how many TEISS soldiers should attempt a platoon sized mission. This lack of knowledge is not only a limitation, but is also the primary question that we are trying to answer in this study.

E. Operational Concept

The TEISS soldier, when substituted in the proper proportion for a conventional infantry platoon, will be able to conduct operations in any present day environment and will be able to utilize near-future weapons and tactics to exploit the advantages inherent to the TEISS system. In addition, the proportional number of TEISS soldiers will be able to conduct a full spectrum of missions with equal or greater combat effectiveness.

II. Alternatives

A. Functional Objectives

The TEISS future infantry soldier is the enhanced version of the present-day infantry soldier. It has no degradation due to NBC environments and has enhanced communication. The TEISS soldier has greater survivability due to body armor and has enhanced accuracy and lethality. His probability of hit and kill is greater than that of the conventional infantry soldier, while the enemy's probability of kill is lower due to the body armor. We increased the probability of kill for the TEISS because he has enhanced sight and can focus on the more lethal areas of the enemy.

Because of his increased accuracy, he is more lethal. We want the TEISS soldiers to be able to use weapons that the infantry soldier is unable to handle, complete missions in difficult terrain, and use enhanced tactics, such as a greater distance between the soldiers during movement.

B. Description of Alternatives

The following alternatives have been considered and evaluated in order to determine how many TEISS soldiers equal a conventional infantry platoon in lethality. The alternatives consist of the conventional infantry platoon, a Low-End TEISS, and a High-End TEISS. Each alternative is divided into three elements - the security element, the attack element, and the support element. We have three different TEISS soldiers - the TEISS leader, the TEISS M203, and the TEISS SAW. The TEISS leader carries the M16A2 rifle, while the TEISS M203 and SAW have greater accuracy and lethality than the conventional M203 and SAW. The TEISS alternatives do not have a M60 Light Machine Gun because our simulation runs showed that the M60, coupled with either the M203 or the SAW, gave the TEISS section much more firepower with just a few TEISS soldiers than the conventional infantry platoon did with thirty-four soldiers.

We built the conventional soldiers and the TEISS soldiers using Army Field Manuals and common sense. We used typical infantry soldiers and their weapons for the conventional infantry platoon. The weapons that the

conventional infantry platoon used were the M16A2 rifle, the 5.56mm SAW, the M203, and the M60 Light Machine Gun. Building TEISS soldiers required some more information, which we got from White Sands Missile Range, Dismounted Battle Laboratory, ARDEC, and NATICK. We enhanced certain attributes of the TEISS soldier based on the goals of the client, the conventional weapons of the infantry soldier, and common sense. A couple of the attributes that we enhanced were the accuracy and the lethality by increasing the probability of a hit and probability of a kill. The weapons that the TEISS soldiers used were the M16A2 rifle, the SAW, and the M203.

1. Conventional infantry platoon

The conventional infantry platoon consists of thirty-four soldiers. The headquarters section consists of one platoon leader, one platoon sergeant, one ratello, and two M60 units, with each M60 unit consisting of two men. The three squads each have a squad leader, two team leaders, two M203s, two SAWs, and two riflemen. The security element is placed on both flanks of the assault and support elements with each security team consisting of an M203 and a SAW. The support element consists of the two M60 units, the platoon sergeant, and two M203s. Finally, the attack element consists of the platoon leader, RTO, three squad leaders, six team leaders, six riflemen, two M203s, and four SAWs. This turns out to be one full squad, one squad minus

the M203s, and one squad minus the M203s and SAWs attacking the drug processing plant.

2. Low-End TEISS

The Low-End TEISS alternative only has seven soldiers. There is a TEISS leader, four SAWs, and two M203s. Within this section, the assault force consists of the TEISS leader, one SAW, and one M203, while the support element has one SAW and one M203 and the security on both flanks has one SAW each. The Low-End TEISS has a small enough number of TEISS soldiers in order for them to take longer to raid and kill all the enemy than the conventional infantry platoon. We would hope to see significantly lower responses from our MOEs measured in the simulation runs.

3. High-End TEISS

The High-End TEISS alternative operates with twenty TEISS soldiers so that it would take less time than the base case to complete the mission. There are four soldiers in the security element, eight in the support element, and eight in the assault force. One SAW and one M203 are in each security element; four SAWs, three M203s, and one TEISS leader are in support as well as the attack force. Opposite from the Low-End TEISS alternative, we would hope to see significantly higher responses from our MOEs measured in the simulation runs.

We assumed a linear relationship between the Low-End and High-End TEISS alternatives based on the number of soldiers versus the time it takes to raid and kill all of

the enemy. The independent variable is the number of TEISS soldiers, whereas the dependent variable is the MOE. The time it takes to kill all the enemy and the survival percentage varies as the number of TEISS soldiers is varied. Our graphs have the number of soldiers along the x-axis and the MOE along the y-axis From this linear relationship, we could determine how many TEISS soldiers would equal the conventional infantry platoon in lethality, which is thirteen TEISS soldiers.

III. Analysis of Alternatives

A. Models

In order to evaluate the TEISS soldier alternatives, we needed to model the use of the soldiers in a drug raid. This was done by using the Janus(A) computer simulation system. This system has many features that made it a good model with which to conduct our evaluation. First, Janus allows us to recreate the terrain of a Latin American country where drug lords might operate, which allowed us to evaluate the TEISS soldiers in Latin America terrain. Second, Janus easily allows us to use the TEISS soldier in a Monte-Carlo simulation scenario and evaluate its effectiveness over a series of eight runs for each alternative, where we would then measure the mean response of each MOE and estimate Confidence Intervals at a specific significance level. Janus makes this a very easy and rapid task through Auto Janus and because of its ability to speed

up time. This ability allowed us to conduct multiple runs with different random number seeds. The randomness, coupled with multiple runs, provided enough data to compare the TEISS soldier alternatives to a conventional present-day infantry platoon.

B. Measures of Effectiveness

In order to evaluate the effectiveness of the two TEISS soldier alternatives, it was important to select measures of effectiveness (MOE) that measured the systems ability to satisfy our functional objectives and mission needs. Keeping this in mind, we picked the following MOEs:

1. Mission time
2. Survival percentage

We had other MOEs as well; however, statistically they were unusable at a specified significance level.

1) Mission Time

Definition of the Measure: Mission time is the elapsed time from the first shots until all the enemy is killed. Input data are the moment of the first shot and the moment the last enemy is killed.

Dimension of the Measure: Interval - elapsed time in term of minutes and seconds.

Limits of the Range of the Measure: The output may assume any positive value.

Rationale for the Measure: It is a direct measure of the interactive lethality of all the weapon systems. We

determined that the faster the element killed all of the enemy, the greater the lethality the element possessed.

Decisional Relevance of the Measure: This measure can be used to compare mission times to each other or to a standard. This is important because it allows us to see what number of TEISS soldiers equal the lethality of a conventional platoon.

Associated Measures:

Probability of Hit

Probability of Kill

Accuracy of Rounds

Lethality of Rounds

2) Survival Percentage

Definition of Measure: Survival percentage is the converse of kill percentage. Kill percentage is the number of TEISS killed divided by the initial number of TEISS soldiers. Input is number of TEISS killed per initial number of TEISS.

Dimension of the Measure: Ratio - a rate in terms of friendly survivors per mission. Unit of measure of output is survivors.

Limits on the Range of the Measure: The measure must include one mission, and as the numerator gets smaller the measure gets better. The output may assume any positive value up to one.

Rationale for the Measure: This measure addresses the element's offensive capability. Survival percentage shows that a good defense is a good offense. This is beneficial

because we do not want to have a smaller survival percentage of TEISS soldiers than the conventional platoon. Basically, this means that we want fewer losses for the TEISS soldiers than the conventional soldiers. Since both TEISS alternatives have fewer soldiers than the conventional infantry platoon, they must have fewer losses in order to have an equal or higher survival percentage. For example, if the High-End TEISS alternative and the conventional platoon both suffer two losses, the two TEISS losses out of twenty TEISS soldiers are more detrimental because the survival percentage is lower than the two losses out of thirty-four conventional soldiers.

Decisional Relevance of the Measure: We want a smaller number of soldiers with an equal or higher survival percentage. Survival percentage is an indicator of enhanced survivability. If fewer soldiers are killed, the firepower is greater for a longer period of time.

Associated Measures:

Kill percentage

Mission time

C. Trade-Off Analysis

Now that we have a step platform of thirteen TEISS soldiers, we can perform trade-off analysis on three other areas of interest. These areas are weapons, environmental conditions and terrain, and tactics. For analysis of other weapons, we can use the Objective Infantry Combat Weapon

(OICW) and the track-box sight. We can test the TEISS soldiers in different environments for analysis of environmental conditions. We can also change the mission or change the terrain in which the TEISS soldier operates, such as analyzing how well the TEISS soldiers perform an ambush. In analyzing tactics, we can use new tactics to exploit the advantages that TEISS soldiers possess.

IV. Summary

After building the TEISS soldier, we conducted simulation runs on Janus(A). From the results of the simulation runs for the TEISS soldiers, we were able to determine the number of TEISS soldiers that equal the lethality of a conventional infantry platoon. We did this based on the linear relationship we drew from the two TEISS alternatives. Thirteen TEISS soldiers equal the lethality of the conventional platoon. Mission time gave us an equal lethality with 12.52 soldiers, while survival percentage gave us equal lethality with 13.11 TEISS soldiers. We did not weight either MOE, but we decided to round to thirteen TEISS soldiers in order to have equal lethality of a conventional platoon. We rounded to thirteen soldiers for a couple of reasons. First, we felt that since thirteen soldiers gave us more firepower than twelve soldiers, it would be safer for the soldiers against the enemy. Also, thirteen soldiers is more conservative. Second, thirteen soldiers gives us an odd number, which allows for two even-

numbered sections along with the leader. The even sections are also more in line with Army doctrine.

Recommendation

For any operations or missions that require the platoon-sized element, we recommend that thirteen TEISS soldiers take their place. The TEISS soldiers have enhanced capabilities, such as communications, body armor, and greater accuracy and lethality because of higher probabilities of a hit and a kill. This gives them a distinct advantage over conventional infantry soldiers.

Annex A

Scenario Script

I. A New World Order

As the Army moves into the 21st Century, it moves into an old and yet surprisingly new world. In the 21st Century the Army will bear a striking resemblance to the frontier armies of the post Civil War era. The force will be reduced to extremely low levels, yet it will still be responsible for conducting successful operations over huge geographic regions. The defeat of the South, like the crumbling of the Soviet threat, forced the army to focus on activities other than conducting and training for large scale warfare.

In the post civil war era, the army was responsible for preserving civil order in the South, while simultaneously fighting an unconventional war against the Indian nations west of the Mississippi River. The challenges for the future army will be no smaller. In the 21st Century, the army will be called on to deploy across the globe to preserve international order or conduct humanitarian missions, as in Somalia, while simultaneously being asked to conduct low intensity or unconventional types of warfare against novel enemies, such as the drug cartel forces of Central America. The mission challenges of the future will undoubtedly place great stress on the operational capabilities of the Army. More will have to be done with less.

II. A New World Infantry

Doing more with less will hit home hardest at the lowest levels of the Army. In particular, the responsibility for conducting successful operations will fall onto the shoulders of the light infantry platoon. No other current Army unit has the combination of flexibility and strength to conduct the potential missions of the future.

Based on the perceived future of the Army, the mission focus of the light infantry platoon should shift also. Training and preparation should center on being a "jack of all trades" force. A force equally capable of fighting low intensity or unconventional wars, and providing humanitarian aid or acting as international policemen. Analysis of the possible future missions of the infantry platoon, shows that some missions are inherently more dangerous than others. These dangerous missions, such as fighting low intensity or unconventional wars, require more attention than others due to the elevated risk of death associated with combat. This increased attention, should come in the form of the development of realistic scenarios that meet these future combat situations. In light of the U.S.'s increasing commitment to stop the flow of drugs into the country, one possible mission brings itself to our attention. The army will undoubtedly be tasked to help reduce the flow of drugs into the U.S.. The successful accomplishment of this mission will fall on the shoulders of the light infantry platoon.

III. A Old World Mission

In 1986, the U.S. Army conducted Operation Blast Furnace, its first offensive action to curb the flow of drugs into the U.S.[1] Operation Blast Furnace, which targeted cocaine processing labs in Bolivia, involved 160 soldiers of the 193rd. Infantry Brigade (Light) and six UH-60 Black Hawk helicopters.[2] An intelligence preparation of the battlefield (IPB), conducted by the Army, identified "the coca base/cocaine hydrochloric acid (HCL) laboratory as the critical attack node" of the operation.[3] In the operation, the infantrymen were responsible for attacking processing labs, subduing any resistance, capturing any "narcotrafficers" present, and destroying any means of cocaine production present at the objective.[4] As in the past, the future light infantryman will undoubtedly be called on again to conduct similar combat operations. In the future however, there are two new major concerns. First the narcotrafficers are more heavily armed now than in 1986,

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[1]Jaime Malamud-Goti, Smoke and Mirrors, (Boulder: Westview Press, 1992) 30.

[2]Jaime Malamud-Goti, Smoke and Mirrors, (Boulder: Westview Press, 1992) 30.

[3]LTC John T. Fishel. "Developing a Drug War Strategy, Lessons From Operation Blast Furnace." Military Review 71 no 6 (1991): 62.

[4]LTC John T. Fishel, "Developing a Drug War Strategy, Lessons From Operation Blast Furnace," Military Review 71 no 6 (1991): 62.

and the types of raids that 160 men conducted in 1986 will be tasked out to the thirty four-men of the light infantry platoon due to the diminished size of the army.

IV. A Typical New World Mission

In order to be prepared to conduct missions similar to those in Operation Blast Furnace, it is important to understand the operational requirements and tactics involved in raiding a Central American drug processing lab. The rest of this paper will chronicle the flow events that occur as a typical light infantry platoon attempts a mission of this nature.

Before discussing the operation itself, it is necessary to know what resources the typical light infantry platoon can employ in an attack. In its present configuration, the light infantry platoon consists of 34 soldiers divided into a seven man headquarters section and three nine man squads. The headquarters section is composed of the Platoon Leader, Platoon Sergeant, the RATELO, two M-60 machine gunners, and two M-60 assistant gunners. Each member of the section carries the M16A2 rifle except for the two M-60 gunners. Each of the nine man squads is comprised of a Squad Leader, and two team leaders who are armed with M16s, two squad automatic machine gunners armed with SAW light machine guns, two grenadiers armed with M16s and M203 40mm grenade launchers, and two riflemen armed with M16A2 rifles.

Individuals may also carry an assortment of hand grenades, light antitank weapons, demolition charges, and 9mm Barretta pistols. The platoon communicates to its higher command utilizing an AN/PRC-77 radio, which is operated by the RATELO, and the Platoon Leader communicates to his Platoon Sergeant and Squad Leaders via AN/PRC-126 radios. The platoon, may also be equipped with up to two 60mm mortars for indirect fire support, if the mission demands it. In addition to the weaponry and communications gear, the platoon carries its own food, water, and medical supplies.

Now that the force has been identified, it is now necessary to decide how the light infantry platoon will conduct its attack against the cocaine lab. The tactic of choice for this type of mission is the same tactic that was employed in Operation Blast Furnace: the raid. This tactic can be seen as appropriate for many reasons. According to the Army, the raid is "an attack that includes a planned withdrawal from the objective."[5] Since the drug processing facility has no real tactical advantage, it is not desirable to occupy it after destroying its ability to process cocaine. In addition, raids are "done to destroy or capture enemy personnel or equipment."[6] This statement fits the mission at hand perfectly if the enemy is considered to be

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[5]Field Manual 7-70, Light Infantry Platoon/Squad, (Washington: Department of the Army, 1986) 5-27.

[6]Field Manual 7-70, Light Infantry Platoon/Squad, (Washington: Department of the Army, 1986) 5-27.

narcotrafficers, and their equipment is defined as cocaine processing paraphernalia.

Now, all that is necessary to set our platoon in motion is a target. Target identification, the location of suspected or known processing plants, would be conducted by higher headquarters using a wide array of intelligence gathering means. National resources, such as satellite intelligence, or high-altitude aerial photography can be used in conjunction with local information gathered by native intelligence organizations. Once these sources identify a target that is suitable for our platoon to engage, intelligence will be given to the Platoon Leader, and the mission will be launched. Suitable targets can include processing plants with fewer than ten permanent structures and armed guard forces of fewer than ten to twelve men. To send a platoon against a processing plant with more structures or armed defenders, would place the platoon in great danger due to their lack of numerical superiority and their degraded ability to control the situation.[7] Assuming that a suitable target has been selected, and the intelligence has been provided to the platoon, the operation can now be launched.

The raid itself will follow a five phase format.[8] The first phase occurs when the platoon infiltrates the

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[7]Interview with CPT Jeffrey Terhune, Infantry Officer, 28 Jan. 1993.

[8]Field Manual 7-85, Ranger Unit Operations, (Washington: Department of the Army, 1987) 5-2.

objective area. Infiltration may take any of a number of forms, such as by foot, by air-assault, by airborne insertion, or by amphibious insertion.[9] Depending on the situation, this movement will most likely be conducted at night to exploit the low-light vision and thermal sensing capability that the Army possesses.[10] This phase ends when the platoon reaches a pre-determined assembly area in the general area of the processing plant. Movement is then initiated to an objective rally point. This rally point is located approximately two to four kilometers from the processing plant. It will also serve as a place for the platoon to link up after the raid has taken place.[11] At this time a four man reconnaissance element will be sent out to locate the cocaine lab. Once it has been found, two soldiers from the team will keep eyes on the objective, while the other two will return to inform the Platoon Leader of their discovery. The Platoon Leader and the Squad leaders will then conduct a leaders recon of the objective, observing it from different vantage points to ensure that the target is consistent with the pre-mission intelligence. If it is, the leader's recon party moves back to the objective rally point and begins phase two.

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[9]Field Manual 7-85, Ranger Unit Operations, (Washington: Department of the Army, 1987) 4-6 - 4-23.

[10]Interview with CPT Jeffrey Terhune, Infantry Officer, 28 Jan. 1993.

[11]Interview with 1LT Claude E. House, Infantry Officer, 26 Jan. 1993.

Phase two consists of sealing off the objective from possible reinforcement or support. The sealing force can consist of up to four soldiers from a squad that has been designated as the support squad.[12] They will observe and cover the likely approach routes to the objective. Next, the Platoon leader will then place his key weapons, the M-60 machine guns, orienting their fires towards the objective. These key weapons, taken from the HQ section of the platoon, will be placed in positions with the remainder of the support squad. Along with the M-60s, the rest of the support squad will orient its fires on the objective to support the assaulting element of the raid.[13] After placing the key weapons, the platoon leader will join the assault element of the raid.[14] This element will consist of one or two rifle squads depending on the size of the processing plant. The assault element will take up pre-raid positions in the nearest covered and concealed positions outside of the objective.[15] The assault then moves into the third phase.

The third phase is the raid phase itself. On a designated signal, the assault party will rapidly advance on the objective while the support squad and the M-60s fire in support of the movement. The attack continues until the "enemy force at or near the objective is overcome by

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[12]Ibid.
[13]Ibid.
[14]Ibid.
[15]Ibid.

surprise and violent attack, using all available firepower for shock effect."[16] Phases four and five are then rapidly carried out. Phase four involves the rapid destruction of the facility before any reinforcing forces can reach the processing plant. Phase five is initiated as the platoon consolidates at the objective rally point and "quickly withdraws from the objective" with prisoners and other important seized items.[17] The completion of the fifth phase signifies the end and a new beginning for the light infantry platoon. After conducting the mission, the unit will discuss its lessons learned, and prepare to be called on again to carry out another mission.

V. The New New World Order

The anti-drug mission discussed in this paper is perhaps the most fitting mission to discuss. It is by far the most dangerous and risky type of mission that a light infantry platoon can realistically attempt. It stretches the limits of the platoon's manpower, firepower, and communications system. This mission is however, only one small task that the light infantry platoon will have to accomplish in an era of "more with less." And as the new world order becomes newer, the missions will undoubtedly

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[16]Field Manual 7-85, Ranger Unit Operations, (Washington: Department of the Army, 1987) 5-2.

[17]Field Manual 7-85, Ranger Unit Operations, (Washington: Department of the Army, 1987) 5-2.

become more difficult and the resources with which to complete them will become more scarce.

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Annex B

CSG output

Janus Commands:
CC GG

Systems General Characteristics

System Number	System Name	Max R Speed Km/Hr	Max Visbi Km	Wpn Rng Km	Sensor Hght (m)	Crew Size	Elem Spac (m)	Chem Xmit Fctr	Gra Sym	Host Cap
5	Teiss_203	6.0	4.0	.3	6.0	1	1.0	1.0	24	*
244	Teiss_LDR	6.0	4.0	.3	6.0	1	1.0	1.0	21	*
245	Teiss_SAW	6.0	4.0	1	6.0	1	1.0	1.0	22	*
246	Teiss_M60	6.0	4.0	1.1	6.0	1	1.0	1.0	23	*
6	CSOL_203	6.0	2.5	.3	2.0	1	1.0	1.0	25	*
247	CSOL_LDR	6.0	2.5	.3	2.0	1	1.0	1.0	20	*
248	CSOL_SAW	6.0	2.5	1	2.0	1	1.0	1.0	84	*
249	CSOL_M60	6.0	2.5	1.1	2.0	1	1.0	1.0	18	*
250	CSOL_RFL	6.0	2.5	.3	2.0	1	1.0	1.0	19	*

Janus Commands:
SY CC FF

SYSTEM FUNCTIONAL CHARACTERISTICS

System Number	System Name	Laser Desig	Mine Disp	Engr Type	Fire Cat	Fly Type	Logis Type	Move Type	Rdr Type	Smk Disp	Chem Det	Swi Cap
5	Teiss_203	0	0	0	3	0	2	3	0	0	0	1
244	Teiss_LDR	0	0	0	1	0	2	3	0	0	0	1
245	Teiss_SAW	0	0	0	1	0	2	3	0	0	0	1
246	Teiss_M60	0	0	0	1	0	2	3	0	0	0	1
6	CSOL_203	0	0	0	1	0	1	3	0	0	0	1
247	CSOL_LDR	0	0	0	1	0	1	3	0	0	0	1
248	CSOL_SAW	0	0	0	1	0	1	3	0	0	0	1
249	CSOL_M60	0	0	0	1	0	1	3	0	0	0	1
250	CSOL_RFL	0	0	0	1	0	1	3	0	0	0	1

Janus Commands:
SY CC VV

Systems Weights & Volumes

System Number	System Name	Normal (fuel&ammo) Weight (lbs)	Normal (fuel&ammo) Volume (CuFt)	Additional Capacity Weight (lbs)	Additional Capacity Volume (CuFt)
5	Teiss_203	270.0	4	40.0	3
244	Teiss_LDR	260.0	4	50.0	4
245	Teiss_SAW	270.0	4	40.0	3
246	Teiss_M60	280.0	4	30.0	3
6	CSOL_203	260.0	4	30.0	3
247	CSOL_LDR	250.0	4	40.0	3
248	CSOL_SAW	260.0	4	30.0	3
249	CSOL_M60	270.0	4	20.0	2
250	CSOL_RFL	250.0	4	40.0	3

Janus Commands:
SY CC DD

DETECTION DATA

System Number	System Name	Minimum Dimension [meters]	Detection Contrast Class [Exposed]	[Defilade]	Thermal Sensors Primary	Secondary
5	Teiss_203	0.20	3.0	3.0	4	2
244	Teiss_LDR	0.20	3.0	3.0	4	2
245	Teiss_SAW	0.20	3.0	3.0	4	2
246	Teiss_M60	0.20	3.0	3.0	4	2
6	CSOL_203	0.20	5.0	6.0	1	2
247	CSOL_LDR	0.20	5.0	6.0	1	2
248	CSOL_SAW	0.20	5.0	6.0	1	2
249	CSOL_M60	0.20	5.0	6.0	1	2
250	CSOL_RFL	0.20	5.0	6.0	1	2

Janus Commands:
SY CC MM

System Vulnerability to Mines

System Number	System Name	Track Width (m)	Belly Width (m)	Total Magnetic Width (m)
5	Teiss_203	0.1000	0.3000	0.5000
244	Teiss_LDR	0.1000	0.3000	0.5000
245	Teiss_SAW	0.1000	0.3000	0.5000
246	Teiss_M60	0.1000	0.3000	0.5000
6	CSOL_203	0.1000	0.3000	0.5000
247	CSOL_LDR	0.1000	0.3000	0.5000
248	CSOL_SAW	0.1000	0.3000	0.5000
249	CSOL_M60	0.1000	0.3000	0.5000
250	CSOL_RFL	0.1000	0.3000	0.5000

Janus Commands:
SY CC PP

Systems POL Data

System Number	System Name	Fuel Type	Tank Size (gal)	Consumption Rate (gal/hr) Stationary	Moving	Fuel Carrying Capacity
5	Teiss_203	2	33	0.5	6.0	
244	Teiss_LDR	2	36	0.5	6.0	
245	Teiss_SAW	2	33	0.5	6.0	
246	Teiss_M60	2	33	0.5	6.0	
6	CSOL_203	*	*	*	*	
247	CSOL_LDR	*	*	*	*	
248	CSOL_SAW	*	*	*	*	
249	CSOL_M60	*	*	*	*	
250	CSOL_RFL	*	*	*	*	

Janus Commands:
KK CC

Systems - Crew Member Kill Probability

Note: Enter probability (in percent) for each system damage category.

System Number	System Name	Mobility Only	Firepower Only	Mobil & Firepower	Catastophic Kill
5	Teiss_203	0.00	0.00	0.00	1.00
244	Teiss_LDR	0.00	0.00	0.00	1.00
245	Teiss_SAW	0.00	0.00	0.00	1.00
246	Teiss_M60	0.00	0.00	0.00	1.00
6	CSOL_LDR	0.00	0.00	0.00	1.00
247	CSOL_LDR	0.00	0.00	0.00	1.00
248	CSOL_SAW	0.00	0.00	0.00	1.00
249	CSOL_M60	0.00	0.00	0.00	1.00
250	CSOL_RFL	0.00	0.00	0.00	1.00

Janus Commands:
SY KK SY

Systems - Kill Category Distributions

Note: Enter percent of kills which fall into each damage category.
(Entries must sum to 100 percent for each system)

System Number	System Name	Mobility Only	Firepower Only	Mobil. & Firepower	Catastrophic Kill
5	Teiss_203	0.00	0.00	0.00	1.00
244	Teiss_LDR	0.00	0.00	0.00	1.00
245	Teiss_SAW	0.00	0.00	0.00	1.00
246	Teiss_M60	0.00	0.00	0.00	1.00
[redacted]	CSOL_203	0.00	0.00	0.00	1.00
[redacted]7	CSOL_LDR	0.00	0.00	0.00	1.00
18	CSOL_SAW	0.00	0.00	0.00	1.00
249	CSOL_M60	0.00	0.00	0.00	1.00
250	CSOL_RFL	0.00	0.00	0.00	1.00

Janus Commands:
DP WP CC

Weapon/Round Characteristic

Wpn Number	Wpn Name	Lay Time [sec]	Aim Time [sec]	Reload Time [sec]	Rounds/ Trigger Pull	Trigger Pulls/ Reload	Round Speed [km/sec]
5	M203T	2.0	3.5	3.5	1.0	1.0	0.1
6	M203	3.0	4.0	4.0	1.0	1.0	0.1
51	5.56Rfl	3.5	2.5	3.5	3.0	7.0	0.6
52	5.56SAW	4.0	2.0	4.5	6.0	33.0	0.975
53	7.62Lmg	4.0	2.0	5.0	6.0	40.0	0.875
72	M16A2T	3.0	2.0	3.0	3.0	20.0	0.6
73	SAWT	3.5	1.5	4.0	6.0	33.0	0.975
74	M60T	3.5	1.5	4.5	6.0	40.0	0.875
76	9mm	2.0	1.0	2.0	1.0	11.0	0.35
77	9mmT	1.5	0.5	1.5	1.0	11.0	0.35
142	OIW	3.0	2.0	10.0	1.0	6.0	0.09

Janus Commands SY WW

Weapons / Ordnance for blue system number 5

--- Wpn/Ord Number--- Relative (1-15)	Absolute (1-250)	Wpn/Ord Name	Basic Load	Upload Time (Minutes)	Rel Wpn/Ord to use if Ammo Expended (1-15)
1	5	M203T	36	2	2
2	72	M16A2T	150	2	1

Janus Commands SY WW

Weapons / Ordnance for blue system number 6

--- Wpn/Ord Number--- Relative (1-15)	Absolute (1-250)	Wpn/Ord Name	Basic Load	Upload Time (Minutes)	Rel Wpn/Ord to use if Ammo Expended (1-15)
1	5	M203T	36	2	2
2	51	5.56Rfl	150	2	1

Janus Commands SY WW

Weapons / Ordnance for blue system number 244

--- Wpn/Ord Number--- Relative (1-15)	Absolute (1-250)	Wpn/Ord Name	Basic Load	Upload Time (Minutes)	Rel Wpn/Ord to use if Ammo Expended (1-15)
1	72	M16A2T	250	2	2
2	77	9mmT	55	2	1
3	142	OIW	66	2	*

Weapons / Ordnance for blue system number 245

--- Wpn/Ord Number--- Relative (1-15)	Absolute (1-250)	Wpn/Ord Name	Basic Load	Upload Time (Minutes)	Rel Wpn/Ord to use if Ammo Expended (1-15)
1	73	SAWT	600	2	*

Weapons / Ordnance for blue system number 246

--- Wpn/Ord Number--- Relative (1-15)	Absolute (1-250)	Wpn/Ord Name	Basic Load	Upload Time (Minutes)	Rel Wpn/Ord to use if Ammo Expended (1-15)
1	74	M60T	900	2	2
2	77	9mmT	55	2	*

Weapons / Ordnance for blue system number 247

--- Wpn/Ord Number--- Relative (1-15)	Absolute (1-250)	Wpn/Ord Name	Basic Load	Upload Time (Minutes)	Rel Wpn/Ord to use if Ammo Expended (1-15)
1	51	5.56Rfl	250	2	2
2	76	9mm	55	2	

Weapons / Ordnance for blue system number 248

--- Wpn/Ord Number--- Relative (1-15)	Absolute (1-250)	Wpn/Ord Name	Basic Load	Upload Time (Minutes)	Rel Wpn/Ord to use if Ammo Expended (1-15)
1	52	5.56SAW	600	2	*

Weapons / Ordnance for blue system number 249

--- Wpn/Ord Number--- Relative (1-15)	Absolute (1-250)	Wpn/Ord Name	Basic Load	Upload Time (Minutes)	Rel Wpn/Ord to use if Ammo Expended (1-15)
1	53	7.62Lmg	900	2	2
2	76	9mm	55	2	1

Weapons / Ordnance for blue system number 250

--- Wpn/Ord Number--- Relative (1-15)	Absolute (1-250)	Wpn/Ord Name	Basic Load	Upload Time (Minutes)	Rel Wpn/Ord to use if Ammo Expended (1-15)
1	51	5.56Rfl	250	2	*

Janus Commands:
WP RR

Ability to Fire on the Move

Fire on: 0=Yes,no restrictions. 1=Stop,can move before impact
the move: 3=Reduce speed to fire. 2=Stop,can only move after impact

Weapon Number	Weapon Name	Guidance Mode	Fire on the Move	On-Board Sensor	Altitude [meters]
5	M203T	0	3		
6	M203	0	3		
51	5.56Rfl	0	0		
52	5.56SAW	0	0		
53	7.62Lmg	0	3		
72	M16A2T	0	0		
73	SAWT	0	0		
74	M60T	0	0		
76	9mm	0	0		
77	9mmT	0	0		
142	OIW	0	0		

Janus Commands:
SY WP MM
MOPP Effects on Weapon Performance

Weapon Number	Weapon Name	MOPP Time Factor	P(Hit) Factor
5	M203T	1.0	1.00
6	M203	1.2	0.7
51	5.56Rfl	1.2	0.8
52	5.56SAW	1.2	0.8
53	7.62Lmg	1.2	0.8
72	M16A2T	1.0	1.00
73	SAWT	1.0	1.00
74	M60T	1.0	1.00
76	9mm	1.1	0.95
77	9mmT	1.0	1.00
142	OIW	1.0	1.00

Janus Commands:
SY VV

Systems Vulnerability to Artillery

System Number	System Name	Vulnerability Category (1 thru 28) Exposed	Protected
5	Teiss_203	3	4
244	Teiss_LDR	3	4
245	Teiss_SAW	3	4
246	Teiss_M60	3	4
6	CSOL_203	2	3
247	CSOL_LDR	2	3
248	CSOL_SAW	2	3
249	CSOL_M60	2	3
250	CSOL_RFL	2	3

Janus Commands:
SY AA CC

ARTILLERY CHARACTERISTICS

System Number 5

		Munition Reliability	Round	Sub-M
Tubes per	1.0			
Bomblets	1.0	Open	0.9	0.0
Planning	5.0	Wood	0.85	0.0
Reload Tm	5.0	Town	0.8	0.0
ICM Eff S	0.0			
ICM Eff I	0.0			
HE,WP,FL	5.0			

We need to do the rest of this table as well.

Janus Commands:
SY AA CC

ARTILLERY CHARACTERISTICS

System Number 6

		Munition Reliability	Round	Sub-M
Tubes per	1.0			
Bomblets	1.0	Open	0.9	0.0
Planning	5.0	Wood	0.85	0.0
Reload Tm	5.0	Town	0.8	0.0
ICM Eff S	0.0			
ICM Eff I	0.0			
HE,WP,FL	5.0			

Janus Commands:
SY AA II

Artillery Round Allotments
Round/System Initial Stockage Level

System Number	System Name	ROUND TYPE HE	HC	CH	IC	G1	G2	FM	WP	BS	FL	RP	T1
5	M203T	30	6										
6	M203	30	6										

Janus Commands:
SY AA HE

HE LETHAL AREAS for BLUE system number 5: Teiss_203

Vulnerability Category	AOF 800			AOF 1600			AOF 2400		
	OPEN	WOOD	TOWN	OPEN	WOOD	TOWN	OPEN	WOOD	TOWN
3 PERS P/PROT	63.6	38.5	38.5	63.6	38.5	38.5	63.6	38.5	38.5

Janus Commands:
SY AA HE

HE LETHAL AREAS for BLUE system number 6: CSOL_203

Vulnerability Category	AOF 800			AOF 1600			AOF 2400		
	OPEN	WOOD	TOWN	OPEN	WOOD	TOWN	OPEN	WOOD	TOWN
3 PERS PRONE	63.6	38.5	38.5	63.6	38.5	38.5	63.6	38.5	38.5

Janus Commands:
SY AA AA

ARTILLERY ALGORITHM SELECTION for System Number 5: M203T

Vulnerability Cat.	Algorithm	Vulnerability cat.	Algorithm
1 PERS STAND	2	15 TRU WHL HVY	1
2 PERS PRONE	2	16 SP CAN LT	1
3 PERS P/PROT	2	17 SP CAN MED	1
4 PERS FOXHOL	2	18	
TANK MEDIUM	1	19	
TANK HI	1	20 MRL HVY	1
7 TANK BRIDGE	1	21	
8 APC TRK HVY	1	22 ADW TRK I	1
9 APC TRK MED	1	23 ADW TRK II	1
10 APC TRK (+)	1	24 ADW LAU WHL	1
11 APC WHL MED	1	25 AA GUN TRK	1
12 APC WHL LT	1	26 HEL MED I	1
13 TRU WHL MED	1	27 HEL MED II	1
14 TRU WHL LT	1	28 HEL MED III	1

Janus Commands:
SY AA AA

ARTILLERY ALGORITHM SELECTION for System Number 6: M203

Vulnerability Cat.	Algorithm	Vulnerability cat.	Algorithm
1 PERS STAND	2	15 TRU WHL HVY	1
2 PERS PRONE	2	16 SP CAN LT	1
3 PERS P/PROT	2	17 SP CAN MED	1
4 PERS FOXHOL	2	18	
5 TANK MEDIUM	1	19	
6 TANK HI	1	20 MRL HVY	1
7 TANK BRIDGE	1	21	
8 APC TRK HVY	1	22 ADW TRK I	1
9 APC TRK MED	1	23 ADW TRK II	1
10 APC TRK (+)	1	24 ADW LAU WHL	1
11 APC WHL MED	1	25 AA GUN TRK	1
12 APC WHL LT	1	26 HEL MED I	1
13 TRU WHL MED	1	27 HEL MED II	1
14 TRU WHL LT	1	28 HEL MED III	1

Annex C

Ph/Pk datasets

Table 211 for PH (CONV_7.62 Lt MG)

	---	400	600	800	1200
SSDF	.45	.40	.35	.25	
SSDH	.45	.40	.35	.25	
SSEF	.80	.50	.40	.20	.05
SSEH	.90	.60	.40	.30	.10
SMDF	Not Used				
SMDH	Not Used				
SMEF	.75	.65	.55	.40	.10
SMEH	.80	.70	.60	.45	.15
MSDF	.35	.20	.10	.01	
MSDH	.40	.30	.20	.05	
MSEF	.55	.45	.35	.25	.05
MSEH	.60	.50	.40	.20	.05
MMDF	Not Used				
MMDH	Not Used				
MMEF	.55	.30	.20	.05	.05
MMEH	.60	.45	.25	.15	.05

Table 263 for PH (SIPE_5.56Rf1)

	---	250	500	750	1000
SSDF	.99	.63	.60	.46	.26
SSDH	.99	.63	.60	.46	.26
SSEF	.99	.95	.90	.70	.50
SSEH	.99	.95	.90	.70	.50
SMDF	Not Used				
SMDH	Not Used				
SMEF	.99	.95	.90	.70	.50
SMEH	.99	.95	.90	.70	.50
MSDF	.99	.63	.60	.46	.26
MSDH	.99	.63	.60	.46	.26
MSEF	.99	.95	.90	.70	.50
MSEH	.99	.95	.90	.70	.50
MMDF	Not Used				
MMDH	Not Used				
MMEF	.99	.95	.90	.70	.50
MMEH	.99	.95	.90	.70	.50

Table 264 for PH (SIPE_5.56 SAW & SIPE_7.62 Lt MG)

	---	300	600	900	1200
SSDF	.99	.63	.60	.46	.26
SSDH	.99	.63	.60	.46	.26
SSEF	.99	.95	.90	.70	.50
SSEH	.99	.95	.90	.70	.50
SMDF	Not Used				
SMDH	Not Used				
SMEF	.99	.95	.90	.70	.50
SMEH	.99	.95	.90	.70	.50
MSDF	.99	.63	.60	.46	.26
MSDH	.99	.63	.60	.46	.26
MSEF	.99	.95	.90	.70	.50
MSEH	.99	.95	.90	.70	.50
MMDF	Not Used				
MMDH	Not Used				
MMEF	.99	.95	.90	.70	.50
MMEH	.99	.95	.90	.70	.50

Table for the CONV_30MM Airburst for PH

	100	200	400	600
SSDF	.90	.70	.42	.28
SSDH	.90	.70	.42	.28
SSEF	.90	.70	.42	.28
SSEH	.90	.70	.42	.28
SMDF	Not Used			
SMDH	Not Used			
SMEF	.90	.70	.42	.28
SMEH	.90	.70	.42	.28
MSDF	.90	.70	.42	.28
MSDH	.90	.70	.42	.28
MSEF	.90	.70	.42	.28
MSEH	.90	.70	.42	.28
MMDF	Not Used			
MMDH	Not Used			
MMEF	.90	.70	.42	.28
MMEH	.90	.70	.42	.28

The probabilities are the same for all because of the airburst capability. All the PKs are equal to 1 for 30MM.

Table for the SIPE_30MM Airburst for PH

	100	200	400	600
SSDF	.99	.80	.55	.40
SSDH	.99	.80	.55	.40
SSEF	.99	.80	.55	.40
SSEH	.99	.80	.55	.40
SMDF	Not Used			
SMDH	Not Used			
SMEF	.99	.80	.55	.40
SMEH	.99	.80	.55	.40
MSDF	.99	.80	.55	.40
MSDH	.99	.80	.55	.40
MSEF	.99	.80	.55	.40
MSEH	.99	.80	.55	.40
MMDF	Not Used			
MMDH	Not Used			
MMEF	.99	.80	.55	.40
MMEH	.99	.80	.55	.40

The probabilities are the same for all because of the airburst capability. All the PKs are equal to 1 for 30MM.

Table for PH (CONV_9MM)

	---	50	100	150
SSDF	.70	.35	.15	.05
SSDH	.70	.35	.15	.05
SSEF	.90	.55	.30	.10
SSEH	.90	.55	.30	.10
SMDF	Not Used			
SMDH	Not Used			
SMEF	.80	.40	.20	.05
SMEH	.80	.40	.20	.05
MSDF	.50	.25	.10	.05
MSDH	.50	.25	.10	.05
MSEF	.65	.35	.20	.05
MSEH	.65	.35	.20	.05
MMDF	Not Used			
MMDH	Not Used			
MMEF	.50	.30	.10	.05
MMEH	.50	.30	.10	.05

Table for PH (SIPE_9MM)

	---	50	100	150
SSDF	.80	.45	.25	.15
SSDH	.80	.45	.25	.15
SSEF	.99	.75	.40	.20
SSEH	.99	.75	.40	.20
SMDF	Not Used			
SMDH	Not Used			
SMEF	.90	.50	.30	.15
SMEH	.90	.50	.30	.15
MSDF	.70	.35	.20	.15
MSDH	.70	.35	.20	.15
MSEF	.75	.50	.30	.15
MSEH	.75	.50	.30	.15
MMDF	Not Used			
MMDH	Not Used			
MMEF	.65	.40	.20	.15
MMEH	.65	.40	.20	.15

Table 164 for PK (CONV_5.56Rfl)

	---	100	200	400	800
M/DF	.40	.35	.20	.05	.01
M/DH	.50	.45	.30	.10	.01
M/EF	.60	.55	.40	.20	.05
M/EH	.70	.60	.50	.30	.05

Table 165 for PK (CONV_5.56 SAW)

	---	400	600	800	1200
M/DF	.60	.55	.50	.45	.40
M/DH	.60	.55	.50	.45	.40
M/EF	.70	.65	.60	.55	.50
M/EH	.70	.65	.60	.55	.50

Table 211 for PK (CONV_7.62 Lt MG)

	---	400	600	800	1200
M/DF	.80	.70	.60	.50	.30
M/DH	.80	.70	.60	.50	.30
M/EF	.90	.80	.70	.60	.40
M/EH	.90	.80	.70	.60	.40

Table 390 for PK (SIPE_5.56Rfl). **CHANGE from Table 390 to 1000.**

	---	100	200	400	800
M/DF	.50	.45	.30	.15	.10
M/DH	.60	.55	.40	.20	.10
M/EF	.70	.65	.50	.30	.15
M/EH	.80	.70	.60	.40	.15

Table 1001 for PK (SIPE_7.62 Lt MG).

	---	400	600	800	1200
M/DF	.90	.80	.70	.60	.40
M/DH	.90	.80	.70	.60	.40
M/EF	.99	.90	.80	.70	.50
M/EH	.99	.90	.80	.70	.50

Table 1002 for PK (SIPE_SAW).

	---	100	200	400	800
M/DF	.70	.65	.60	.55	.50
M/DH	.70	.65	.60	.55	.50
M/EF	.80	.75	.70	.65	.60
M/EH	.80	.75	.70	.65	.60

Table 1003 for PK (CONV_9MM)

	---	50	100	150
M/DF	.85	.70	.50	.25
M/DH	.85	.70	.50	.25
M/EF	.90	.80	.60	.40
M/EH	.90	.80	.60	.40

Table 1004 for PK (SIPE_9MM)

	---	50	100	150
M/DF	.90	.80	.60	.35
M/DH	.90	.80	.60	.35
M/EF	.99	.90	.70	.50
M/EH	.99	.90	.70	.50

For the conventional soldiers, we used the probabilities that were already in the database. We swithced some of the flank and head-on shots because head-on shots have more area to hit than flank shots, but the database had higher flank probabilities than head-on probabilities.

We enhanced the probability of hit for the Teiss soldiers because they have advanced sight capabilities. We enhanced the probabilities anywhere from approximately 10-15 percent above the conventional probabilities. Since they have advanced sight capabilities, we feel that they have an increased possibility of hitting lethal areas; therefore, we increased their probability of kill as well.

For the Red Ph tables, we used what values were already in the database, whereas for the Pk values, we used the values that Rob Walker and Vic Ferson came up with. They used a ratio of the vulnerable area of the soldier to the overall area of the soldier for the Pk tables.

Relative #		PH / PK Table	
51	CONV_5.56Rfl	164/164	
52	CONV_5.56 SAW	165/165	
53	CONV_7.62 Lt MG	211/211	
72	SIPE_5.56Rfl	263/390	==> 1000
73	SIPE_5.56 SAW	264/391	==> 1002
74	SIPE_7.62 Lt MG	264/391	==> 1001
75	CONV_9 mm	1000/1003	
75	SIPE_9 mm	1001/1004	

Table 164 for PH (CONV_5.56Rfl)

	---	100	200	400	800
SSDF	.32	.16	.08	.04	
SSDH	.32	.16	.08	.04	
SSEF	.99	.64	.32	.16	
SSEH	.99	.64	.32	.16	
SMDF	Not Used				
SMDH	Not Used				
SMEF	.64	.32	.16	.08	
SMEH	.64	.32	.16	.08	
MSDF	.32	.16	.08	.04	
MSDH	.32	.16	.08	.04	
MSEF	.48	.24	.12	.06	
MSEH	.48	.24	.12	.06	
MMDF	Not Used				
MMDH	Not Used				
MMEF	.24	.12	.06	.03	
MMEH	.24	.12	.06	.03	

Table 165 for PH (CONV_SAW)

	---	100	200	400	800
SSDF	.50	.40	.30	.20	
SSDH	.50	.40	.30	.20	
SSEF	.80	.65	.60	.55	.35
SSEH	.80	.65	.60	.55	.35
SMDF	Not Used				
SMDH	Not Used				
SMEF	.90	.70	.50	.45	.25
SMEH	.90	.70	.50	.45	.25
MSDF	.40	.25	.15	.05	
MSDH	.40	.25	.15	.05	
MSEF	.60	.55	.50	.45	.20
MSEH	.60	.55	.50	.45	.20
MMDF	Not Used				
MMDH	Not Used				
MMEF	.40	.35	.30	.25	.05
MMEH	.40	.35	.30	.25	.05

Annex D

Battle Narrative for Conventional Soldier Raid (TEISS 6 and 18 man are similar)

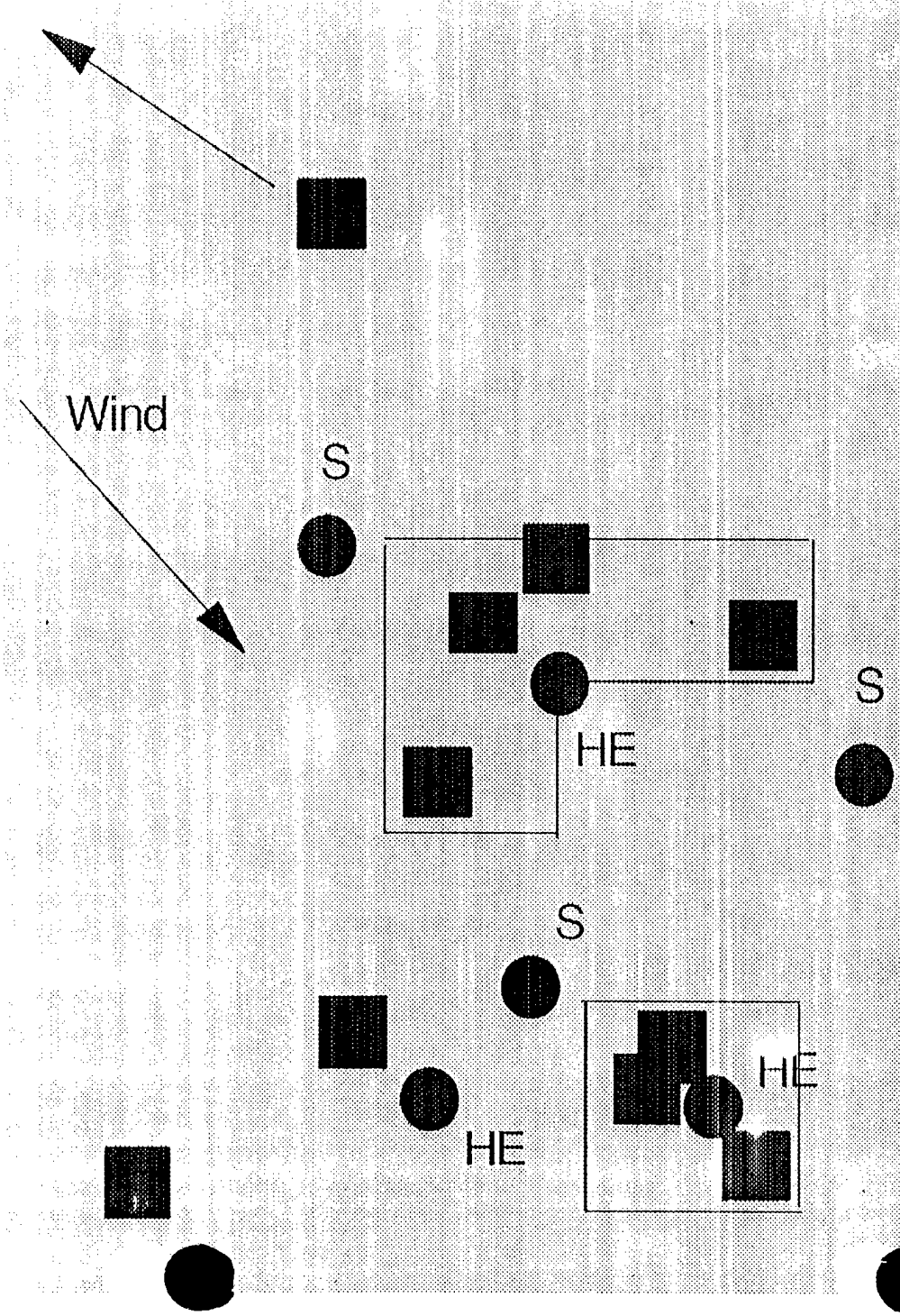
The steps for conducting the Scenario as it was performed for this COEA:

1. Load Scenario
2. Display CAC#1 (Showing assault positions, assault lanes, the support section and security element's position's, the Objective rally point, the limit of advance, and the release point)
<<Scenario begins after leader's recon has been completed, two members of the recon party remain in the support position and the assault position keeping eyes on the objective, and the security teams have already reached their positions>>
3. Place all units (Red and Blue) on hold fire until instructed to remove this restriction
4. Zoom view, size 8, centered on the RP
5. Set Realtime Sync (RS) to 15 until the assaulting squads approach their assault positions.
6. Set RS to 4 and stop task forces (assault squads) individually as they move within the CAC assault position boundaries.
7. Set RS to 1 when they have been stopped
8. Allow Support section to move into their positions and stop, then plan initial timed M203 fires in accordance with Annex E.
9. When M203 firing pound signs show on the screen, take the support squad off hold fire, then immediately take the Red forces off of hold fire, then release the assaulting forces by clicking "GO" with the puck, and take them off hold fire as rapidly as possible.
10. Allow battle to continue until the Red force is eliminated.

Annex E

Initial Timed M203 Fires
Placement and Types

NOTE: The diagram on the following page shows the aiming points for initial M203 Rounds fired in the CSOL Raid. For TEISS High and Low levels, these aiming points were also used, but due to the number of M203s used, all targets were not engaged.



S Round fired is smoke

HE Round fired is HE

Initial Red Locations

Planned Round Locations

Drug Processing Plant

good picture

Annex F

Mission Force Files

Enemy (RED) Forces

1 CMDR
3 LTMG
1 SVD
5 RFL

Conventional Soldier Forces

2 CSOL_LDR
2 CSOL_M60
16 CSOL_RFL
6 CSOL_203
6 CSOL_SAW

Low TEISS Force

Assault Force
1 TEISS_LDR
1 TEISS_SAW
1 TEISS_203
Support Section
1 TEISS_SAW
1 TEISS_203
Security
2 TEISS_SAW

High TEISS Force

Security
2 TEISS_SAW
2 TEISS_203
Support Section
4 TEISS_SAW
1 TEISS_LDR
3 TEISS_203
Assault Force
1 TEISS_LDR
4 TEISS_SAW
3 TEISS_203

Annex G

Design Matrix

	Run Type		
	1 34 Man CSOL	2 8 Man TEISS	3 20 Man TEISS
Run # (Random # Seed)			
1 (01693)	11	12	13
2 (89525)	21	22	23
3 (11149)	31	32	33
4 (93953)	41	42	43
5 (12823)	51	52	53
6 (17800)	61	62	63
7 (29983)	71	72	73
8 (34972)	81	82	83

Annex H

Equivalency Calculations

Using the following data :

Time to mission completion - MOE #1

X values	Y values	CSOL Y value
5	3.8875	1.8625
16	.94375	

and the two point equation of a line : $\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$

$$\frac{y - 3.8875}{x - 5} = \frac{.94375 - 3.8875}{16 - 5}$$

$$y - 3.8875 = (x - 5)\ -2.6761$$

$$y = -2.6761\ x + 5.22557$$

Substituting CSOL's MOE average for Y

X, or the equivalent # of TEISS soldiers is :

X = 12.5675

% Survival Percentage - MOE #2

X values	Y values	CSOL Y value
5	.910714	.970833
16	.992188	

and the two point equation of a line : $\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$

$$\frac{y - .910714}{x - 5} = \frac{.992188 - .910714}{16 - 5}$$

$$y - .910714 = (x - 5)\ .00741$$

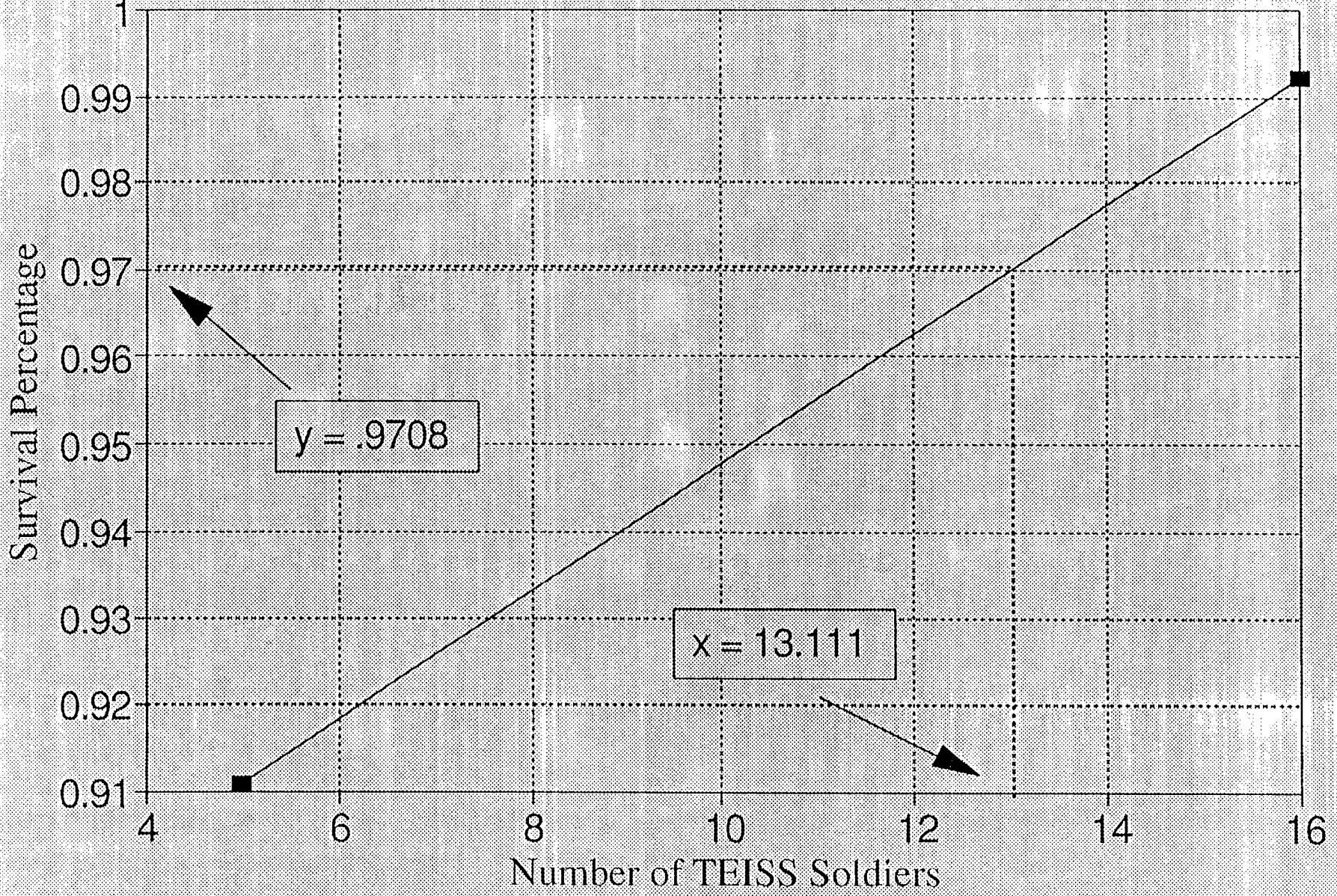
$$y = .00741\ x + .87368$$

Substituting CSOL's MOE average for Y,

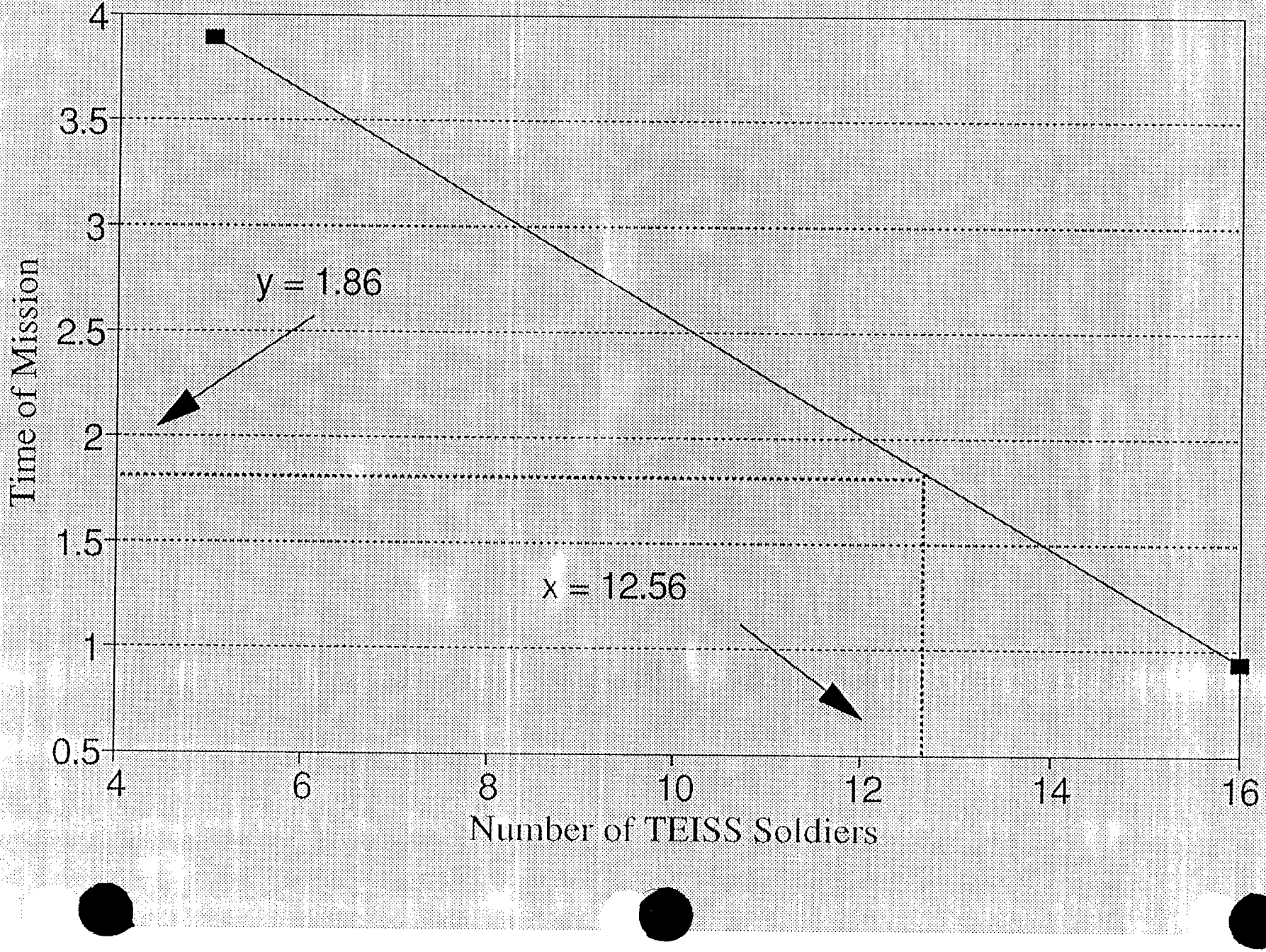
X, or the equivalent # of TEISS soldiers is :

X = 13.111

MOE - Survival Percentage



MOE - Time of Mission



Annex I

Post Processing Data

Time to End Mission Run #	St time.	End. Tm.	
11	30	31.62	1.62
21	27	28.87	1.87
31	27	28.07	1.07
41	31	33.72	2.72
51	30	32.48	2.48
61	29	30.47	1.47
71	27	28.67	1.67
81	30	32	2
Ave			1.8625
12	23	28	5
22	23	29.5	6.5
32	23	25.52	2.52
42	23	23.73	0.73
52	23	25.43	2.43
62	23	29.42	6.42
72	23	23.9	0.9
82	23	29.6	6.6
Ave			3.8875
13	27	31.08	4.08
23	27	27.52	0.52
33	27	27.48	0.48
43	27	27.48	0.48
53	27	27.48	0.48
63	27	27.55	0.55
73	27	27.48	0.48
83	27	27.48	0.48
Ave			0.94375

Annex J

Quattro Pro 4.0
Confidence Interval Calculations

NOTE: The following confidence intervals were calculated to ensure that the MOE's that we conducted our experiment with were actually significant. The comparison of TEISS to CSOL utilized a two tailed Bonferroni test that accounts for the low levels of confidence. We also used the confidence intervals as a method of showing that the High and Low TEISS level MOE data points distinctly "trapped" the CSOL MOE value.

ALSO NOTE: For the Confidence intervals
T - values of 1.51 = 85% CI
1.41 = 80% CI

The calculations are shown in the spreadsheet output that follows.

MOE - Survival Percentage

Run#	CSOL	Teiss-	Teiss+
1	1	1	1
2	1	0.857143	1
3	0.966667	0.857143	1
4	0.933333	1	1
5	0.966667	0.714286	0.9375
6	1	0.857143	1
7	1	1	1
8	0.9	1	1

	T- - CSOL	T+ - CSOL
1	0	0
2	-0.14286	0
3	-0.10952	0.033333
4	0.066667	0.066667
5	-0.25238	-0.02917
6	-0.14286	0
7	0	0
8	0.1	0.1
AVG	-0.06012	0.021354
VAR	0.014577	0.001823
t-STAT	1.35	1.41
1/2 LN	0.057626	0.021282
UPBOUN	-0.00249	0.042637
LOBOUN	-0.11775	7.18E-05
SIG	Yes	Yes

variance case is biased. use unbiased one. resulting the same

$t = \frac{\text{mean}}{\text{var}} = 1.425$ (

$t = 1.4147$ (TS+)

MOE - Time to Mission Completion

Run#	CSOL	Teiss-	Teiss+
1	1.62	5	4.08
2	1.87	6.5	0.52
3	1.07	2.52	0.48
4	2.72	0.73	0.48
5	2.48	2.43	0.48
6	1.47	6.42	0.55
7	1.67	0.9	0.48
8	2	6.6	0.48
	T- - CSOL	T+ - CSOL	
1	3.38	2.46	
2	4.63	-1.35	
3	1.45	-0.59	
4	-1.99	-2.24	
5	-0.05	-2	
6	4.95	-0.92	
7	-0.77	-1.19	
8	4.6	-1.52	
AVG	2.025	-0.91875	✓
VAR	7.4824	2.151412	
t-STAT	1.51	1.51	
1/2 LN	1.460335	0.783058	
UPBOUN	3.485335	-0.13569	
LOBOUN	0.564665	-1.70181	
SIG	Yes	YES	

80% CI for Survival Percentage MOEs			
AVG	0.970833	0.910714	0.992188
VAR	0.001409	0.011297	0.000488
t-STAT	0.896	0.896	0.896
1/2 LN	0.01189	0.033671	0.007
UPBOUN	0.982723	0.944385	0.999188
LOBOUN	0.958943	0.877044	0.985188
SIG	Yes	Yes	

85% CI for Mission Completion MOEs

AVG	1.8625	3.8875	0.94375
VAR	0.28765	6.38905	1.60657
t-STAT	1.415	1.415	1.415
1/2 LN	0.268314	1.264531	0.634105
UPBOUN	2.130814	5.152031	1.577855
LOBOUN	1.594186	2.622969	0.309645
SIG	Yes	YES	

Appendum

Phase II Testing

Enclosure 1

Phase II Scenario Description

The second phase of the design utilized as the primary engagement, a far ambush. (See Annex L for a detailed report of our research and a script of the proper steps to conduct an ambush) In this scenario, the primary changes included an increased number of enemy gunmen, from ten to twenty-five, and the use of different tactics for the TEISS force.

The scenario begins with the TEISS platoon moving in to conduct the raid as it was executed in the first scenario. This time, however, an alert sentry feels as if the processing plant's security has been compromised. He alerts his companions, now numbering twenty-five, at which time they mount on trucks and a zodiac inflatable boat and leave the plant as rapidly as possible. The TEISS force recognizing that their target is fleeing, calls for a helicopter extraction. Two UH-60 Black Hawk helicopters (four for the conventional platoon), pickup and displace the thirty members of the platoon to an ambush site in the gunmen's direction of escape (Two remain to destroy the contents of the processing plant.). The TEISS force divides, upon arrival at the release point, into two one soldier security detachments, an ambush supporting section, and an ambush assault section. They assume their positions in a y-shaped ambush and await the gunmen's arrival. The gunman experience difficulties with their trucks and zodiac

and are forced to abandon them in favor of dismounted travel.

The ambush itself is designed to exploit the TEISS soldier's technological advantages. As a result, the ambush begins for the TEISS platoon near maximum weapon range and lasts for five minutes, including an assault across the objective. The conventional platoon, following more conventional tactics, initiated the ambush at a range well inside of the maximum effective weapon range for the M16A2 rifle (300m).

Enclosure 2

Phase II Description of Alternatives, MOEs, Summary and Recommendations

B. Description of Alternatives

The following alternatives have been considered and evaluated in order to determine the effectiveness of the track-box sight and the OICW. For our analysis in stage two, we chose to alter two factors in the TEISS system - the weapon system and force type. The two force types consist of what we called the "low-end" force level, using a conventional infantry platoon and a "high-end" 17 (13 firers) man TEISS section for the simulation, while the different weapon system alternatives, the track-box sight equipped M16A2 and the Objective Infantry Combat Weapon (OICW), were used by both the conventional platoon and the TEISS section.

Each run of the scenario eventually broke alternative is divided into three elements - the security element, the attack element, and the support element. We have three different TEISS soldiers - a TEISS leader, the TEISS M203, and the TEISS SAW. The TEISS leader carries the SAW, and the TEISS M203 and SAW have greater accuracy and lethality than the conventional M203 and SAW. The TEISS alternatives do not have a M60 Light Machine Gun because our simulation runs showed that the M60, when included in the scenario, was too lethal. This made the TEISS section much more lethal

and as a result, incomparable with the conventional infantry platoon consisting of thirty-four soldiers.

For the purposes of the simulation, we constructed the conventional soldiers and the TEISS soldiers, on the Janus(A) database, using Army Field Manuals and common sense. Attempts were made at all stages to ensure that the construction of these systems created realistic soldier systems. For the sake of our analysis, we used our modeled, basic infantry soldiers and their weapons for the conventional infantry platoon force structure. The weapons that the conventional infantry platoon used were the M16A2 rifle, the 5.56mm M249 SAW, the M203, and the M60 Light Machine Gun. Building TEISS soldiers required some more information, which we got from White Sands Missile Range, Dismounted Battle Laboratory, ARDEC, and NATICK. We enhanced certain attributes of the TEISS soldier based on the goals of the TEISS project, the conventional weapons of the infantry soldier, and common sense. A couple of the attributes that we enhanced were the accuracy and the lethality by increasing the probability of a hit and probability of kill. We also modified the probability of the TEISS system being kill once hit. This change was made to help model the TEISS soldier's heightened awareness of the combat situation and the effectiveness of his body armor.

Alternatives:

1. Low-End Conventional infantry platoon

The conventional infantry platoon consists of thirty-four soldiers. Two of the soldiers were left back at the drug processing plant so there are thirty-two for the ambush with only thirty engaging because two are in security. The security element is placed on both flanks of the assault and support elements with each security team consisting of one SAW each. The support element consists of the two M60 units, a conventional leader, three M203s, two SAWs, and five riflemen. Finally, the assault element consists of a conventional leader, one SAW, two M203s, and eleven riflemen.

2. High-End TEISS

The High-End TEISS alternative has seventeen soldiers. Two of the TEISS soldiers were left at the drug processing plant so there are fifteen for the ambush with only thirteen engaging because two are in security. Among the fifteen soldiers, there are two TEISS leaders, six SAWs, and seven M203s. Within this section, the assault force consists of a TEISS leader, two SAWs, and four M203s, while the support element has one leader, three SAWs and two M203s, and the security on both flanks has one SAW each. We would hope to see significantly higher responses from our MOEs measured in the simulation runs.

The track-box sight enhances sight capability and is placed on the M203s for both the TEISS soldiers and the conventional soldiers. Also, for the conventional soldiers,

the track-box sight is placed on the M16A1 rifles used by the riflemen. The OICW replaces the conventional riflemen's M16A1 as well as the M203s for both TEISS and conventional soldiers since it is a totally different weapon system.

B. Measures of Effectiveness

In order to evaluate the effectiveness of the four TEISS soldier alternatives, it was important to select measures of effectiveness (MOE) that measured the systems ability to satisfy our functional objectives. Keeping this in mind, we picked the following MOEs:

1. Average Enemy Loss
2. Detection Ratio
3. 1/(Friendly Rounds/ Enemy Killed/ Friendly Systems Involved)
4. Average Engagement Range
5. Number of Detections
6. Average Range to Kill
7. Percent Contribution

1) Average Enemy Loss

Definition of Measure: Average enemy loss is the number of enemy soldiers killed during the battle.

Dimension of the Measure: Integer - a number in terms of enemy soldiers killed per mission.

Limits of the Range of the Measure: The output may assume any positive value.

Rationale for the Measure: This measure addresses the lethality of the TEISS soldiers as compared to the conventional soldiers. It also measures the lethality of the track-box sight compared to the OICW.

Decisional Relevance of the Measure: This measure can be used to compare the number of kills using the track-box

sight and the OICW to each other or to a standard. This is important because it allows us to see which weapon is more effective. This measure also can be used to compare the number of kills for the TEISS soldiers and conventional soldiers.

Associated Measures:

Accuracy of Rounds

Lethality of Rounds

2) Detection Ratio

Definition of Measure: Detection ratio is the number of friendly detections to the number of enemy detections. Input data are the moment of the first detection and when the last detection occurs.

Dimension of the Measure: Ratio - number of friendly detections to the number of enemy detections.

Limits of the Range of the Measure: The output can assume any positive value.

Rationale for the Measure: Detection Ratio is beneficial because it directly measures a functional objective of the TEISS systems. One of the key functional objectives is the ability of the TEISS soldiers to detect the enemy in advance. If the soldiers set up in an ambush can be alerted to the presence of the enemy early, then the ambush has been effectively enhanced.

Decisional Relevance of the Measure: By comparing the number of enemy detections versus friendly detections, we

can evaluate which system has better, more beneficial sensors. This will allow us to see whether the TEISS soldiers detect more than the conventional soldiers.

Associated Measures:

Probability of Hit

Probability of Kill

Loss Exchange Ratio

3) 1/(Friendly Rounds/ Enemy Killed/ Friendly Systems Involved)

Definition of Measure:

Dimension of the Measure:

Limits of the Range of the Measure: The output may assume any positive value.

Rationale for the Measure: It is a measure of weapon effectiveness based on the number of weapons.

Decisional Relevance of the Measure: This measure can be used to compare the effectiveness of the track-box sight and OICW for the TEISS and conventional soldiers. The number of weapons is normalized to account for the different number of weapons used by the TEISS and conventional soldiers.

Associated Measures:

Probability of Hit

Probability of Kill

Kill percentage

4) Average Engagement Range

Definition of Measure: The average engagement range is the how far away the enemy is when friendly forces engage.
Dimension of the Measure: Integer - a number in terms of distance (kilometers).
Limits of the Range of the Measure: The output may be any positive value.
Rationale for the Measure: This measure shows how far away the enemy is when friendly forces engage and can be used to measure the effective ranges of the different weapon systems for TEISS soldiers as well as conventional soldiers.
Decisional Relevance of the Measure: This measure can be used to compare the effective ranges of the track-box sight and the OICW for TEISS and conventional soldiers.
Associated Measures:
Probability of Hit
Probability of Kill

5) Number of Detections
Definition of Measure: Number of detections is the number of times that friendly forces detect or 'see' the enemy forces.
Dimension of the Measure: Integer - a number of sightings.
Limits of the Range of the Measure: The output can be any positive value.
Rationale for the Measure: It is a direct measure of the enhanced sight capabilities of the TEISS soldiers as well as the original capabilities of the conventional soldiers.

Decisional Relevance of the Measure: This measure can be used to compare the TEISS soldiers and conventional soldiers sight capabilities to each other. It can also be used to compare the different types of weapons used.

Associated Measures:

Percent contribution

Kill percentage

6) Average Range to Kill

Definition of Measure: The average range to kill is the distance between the enemy and friendly forces when the enemy is killed.

Dimension of the Measure: Integer - a number in terms of distance (kilometers).

Limits of the Range of the Measure: The output can assume any positive value.

Rationale for the Measure: This measure shows how far away the enemy is when friendly forces kill the enemy and can be used to measure the effective ranges of the different weapon systems for TEISS soldiers as well as conventional soldiers.

Decisional Relevance of the Measure: This measure can be used to compare the effectiveness of the track-box sight and the OICW for TEISS and conventional soldiers. This measure also can be used to compare which weapon system is more effective at longer ranges.

Associated Measures:

Probability of Hit

Probability of Kill

Percent contribution

Kill percentage

7) Percent Contribution

Definition of Measure: Percent contribution is the amount that each weapon system contributed to the number of overall kills.

Dimension of the Measure: Ratio - a rate in terms of number of kills per weapon system.

Limits of the Range of the Measure: The measure must include at least one kill, and the output may assume any positive value up to one.

Rationale for the Measure: This measure addresses the element's diverse offensive capability.

Decisional Relevance of the Measure: This measure can be used to compare the offensive capability of each weapon system. It can be used to compare the track-box sight to the OICW for TEISS and conventional soldiers.

Associated Measures:

Kill percentage

C. Trade-Off Analysis

We wanted to conduct weapon testing and perform a trade-off analysis on the track-box sight and the OICW. For analysis of the track-box sight and the OICW, we used a 34 man conventional platoon and a 17 man TEISS section. From

the trade-off analysis, we found that the OICW performs better than when soldiers used the track-box sight. We also found that the conventional soldiers performed better than the TEISS soldiers with respect to the MOEs. Some of the reasons, that the conventional soldiers dominated several of the MOEs, are that the TEISS section did not use M60s. The M60's, utilized by the conventional soldiers, were a major influence on several MOEs. Also, the conventional soldiers, in order to execute the scenario, were given the same intelligence that the TEISS soldier had. By this we mean that the conventional soldiers' ambush positions were the same as those that the TEISS soldiers occupied. These positions were in the enemy's line-of-march assuring that the ambush would take pace. The conventional platoon's attributes, with regard to communications and detection devices, would not normally know the enemy's eventual position with certainty.

IV. Summary

The second phase of our analysis consisted of a full factorial design with force composition and weapon type making up the design points of interest. In this phase we sought to validate our phase I result, that specified that thirteen TEISS soldiers provide the same lethality as thirty firing conventional infantry soldiers. Our Phase II analysis, also concerned itself with conducting a trade off analysis on two emerging Infantry weapon systems, the M16A2

Track box sight system, and the Objective Infantry Combat Weapon. In order to more fully develop tactics and test the operational capabilities of the TEISS soldier, the second phase of the analysis utilized a new scenario. The new scenario, conduced on the same type of terrain, had as its major engagement, a far-ambush of fleeing guerilla/drug cartel gunmen.

The phase II simulations yielded a variety of interesting results and conclusions. First, the thirteen man TEISS force is not truly equivalent to a conventional platoon. Second, the OICW is a significantly better weapon than the Track-Box sight in the hands of both the conventional soldier and the TEISS soldier. And finally, the TEISS soldier, as he is planned is a extremely lethal weapon whose technology and abilities out distance our conventional tactics.

Recommendation

After conducting both phases of the TEISS analysis, we recommend that more simulation be conducted in two areas. First, further investigation into the size of the equivalent TEISS section must be conducted. Our results, in both scenarios seem to be very scenario dependent, with thirteen TEISS soldiers being somewhere near correct. Additional simulation using thirteen firing TEISS soldiers in heavily wooded terrain, is yielding results that show that the

equivalent force is well below thirteen.18 This validates the need to further test the force size before any costly organizational decisions are made. Secondly, further analysis must be conducted into the realm of tactics. The technical capabilities of the TEISS soldier clearly undermine many of the pillars that our conventional tactics are built on. When viewed in a TEISS soldier reference frame our conventional tactics, with respect to speed, surprise, maneuver, mass, and security are very conservative to say the least. Because technology dictates tactics, and because tactics are a major contributor to combat effectiveness, further analysis and development is necessary in this area.

Based on our simulation results, we believe that future simulations should include the M60 machine-gun. In the phase I experiments, the M60 was omitted in order to better equate lethality. In the phase two simulations, the lack of the M60 proved to be a major factor in the inequality detected between the two forces. As a result any TEISS force should be armed with an M60.

---

18 Taken from SE489 Design work conducted by Cadets Robb Walker '93, and Vic Ferson '93.

Enclosure 3

Factorial Design Construction

		Factor			
		1	2	3	Notes
		Soldier Type	Weapon Type	Inter action	
Design Point	1	-	-	+	Con./TBS
	2	+	-	-	TEISS/TBS
	3	-	+	-	Con./OICW
	4	+	+	+	TEISS/OICW

Con. = Conventional Equipped Platoon with 30 soldiers having the capability to fire on the enemy during the simulation.

TEISS = TEISS section with thirteen soldiers having the capability to fire on the enemy during the simulation.

SB = Force Armed in part with M16A2 rifles with the Track box sight system.

OICW = Force Armed in part with the Objective Infantry Combat Weapon.

Enclosure 4

MOE Analysis
for Average Enemy Losses

MOE #1 - Average Enemy Losses

Constants	
k =	2
p =	1
RanNum 1 =	1693
RanNum 2 =	89525
RanNum 3 =	11149
RanNum 4 =	93953
RanNum 5 =	29983
RanNum 6 =	34972
t =	1.478
n =	4

	Low Level	High Level
Factor 1: Force	Infantry: 34 men	TEISS: 17 men
Factor 2: Weapon	Weapon: M16 with Sight Box	Weapon: OICW

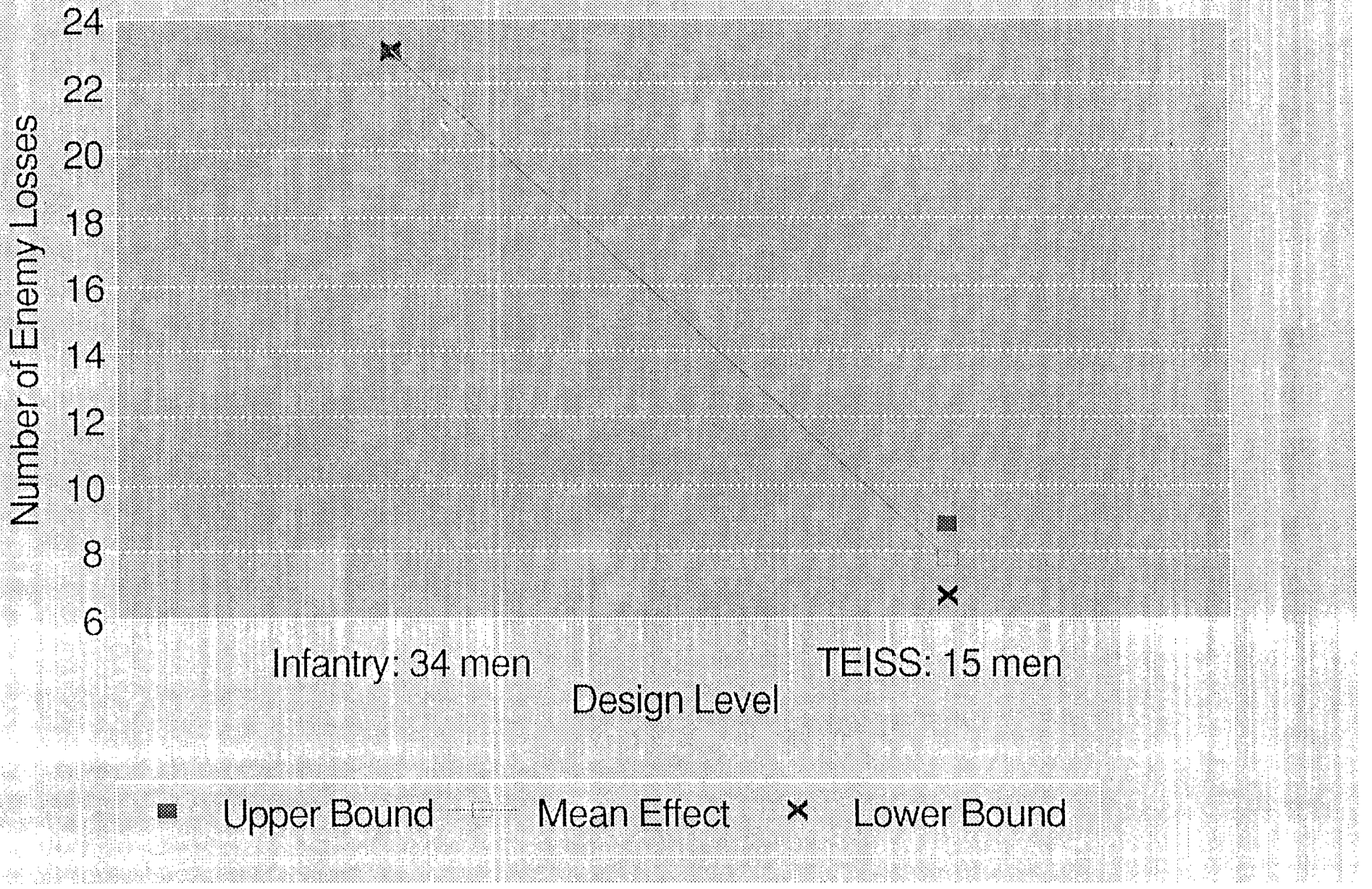
DP	Force	Weapon	RandNum1 1693 Run 1	RandNum2 89525 Run 2	RandNum3 11149 Run 3	RandNum4 93953 Run 4
1	-	-	23	23	23	23
2	+	-	6	7	8	10
3	-	+	23	24	24	23
4	+	+	22	11	11	10
Total Effects:	Force		-9	-14.5	-14	-13
	Weapon		8	2.5	2	0
	Force & Weapon		8	1.5	1	0

Factor 1:	Force	*Factor 2:*	Weapon
Mean Effect:	-12.625	*Mean Effect:*	3.125
Variance:	6.229167	Variance:	11.72917
Half Length:	1.844418	Half Length:	2.530918
Upper Bound:	-10.7806	*Upper Bound:*	5.655918
Lower Bound:	-14.4694	*Lower Bound:*	0.594082
Significant	Yes	*Significant*	Yes

Force & Weapon	
Mean Effect:	2.625
Variance:	13.22917
Half Length:	2.687885
Upper Bound:	5.312885
Lower Bound:	-0.06288
Significant	No

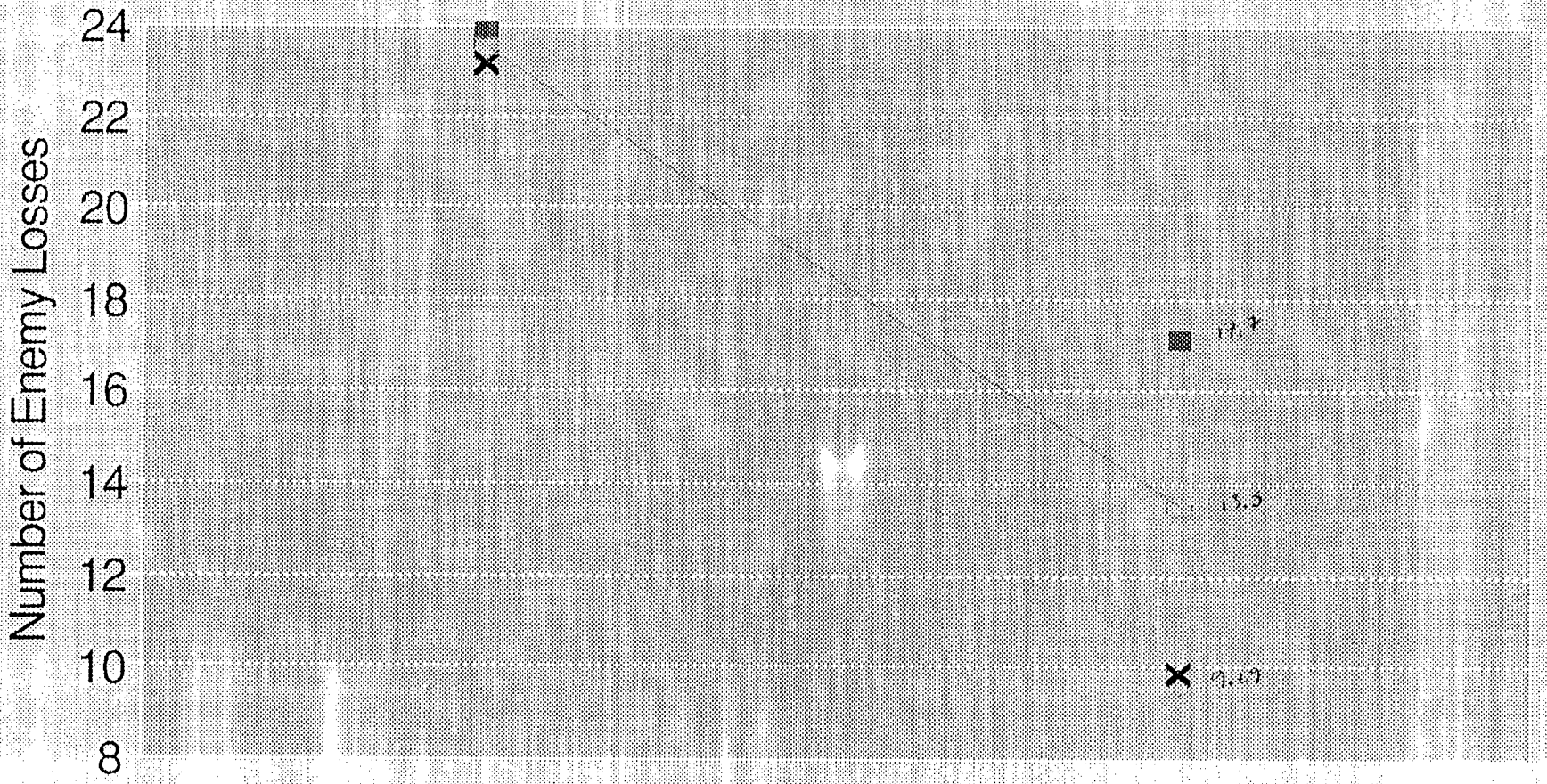
MOE #1 - Average Enemy Losses

Force: DP 1 & 2 (Weapon Set Low)



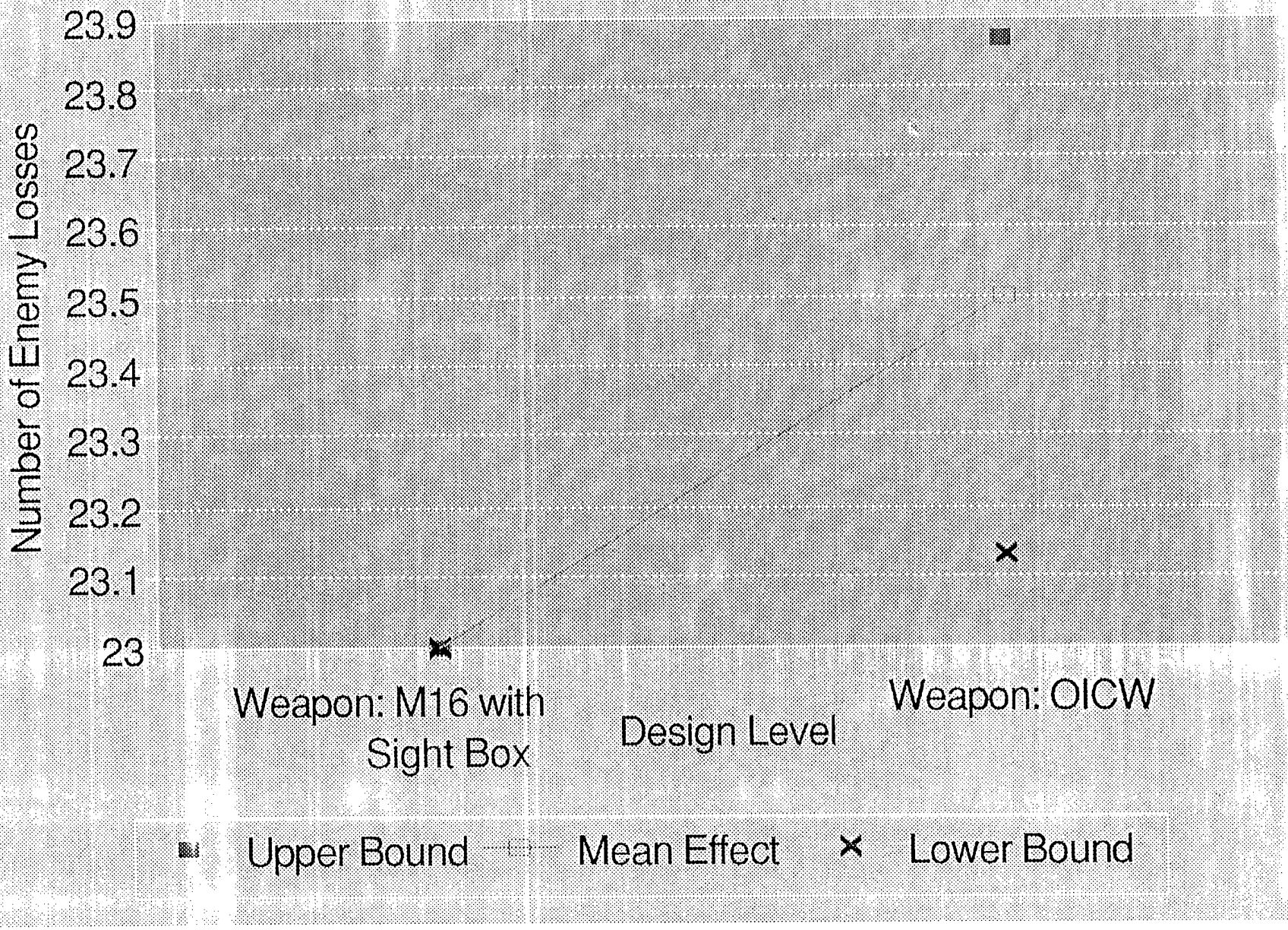
MOE #1 - Average Enemy Losses

Force: DP 3 & 4 (Weapon Set High)



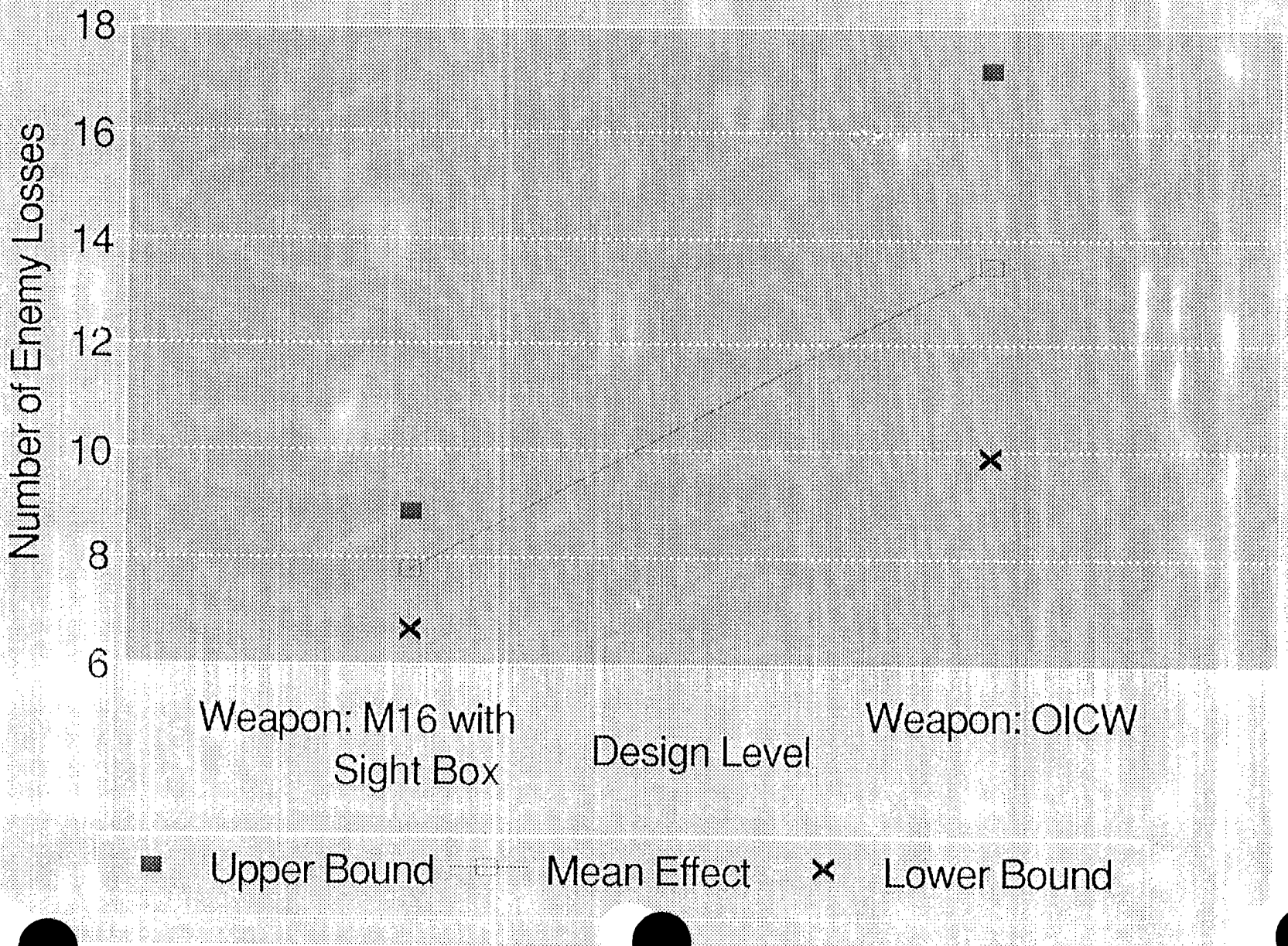
MOE #1 - Average Enemy Losses

Weapon: DP 1 & 3 (Force Set Low)



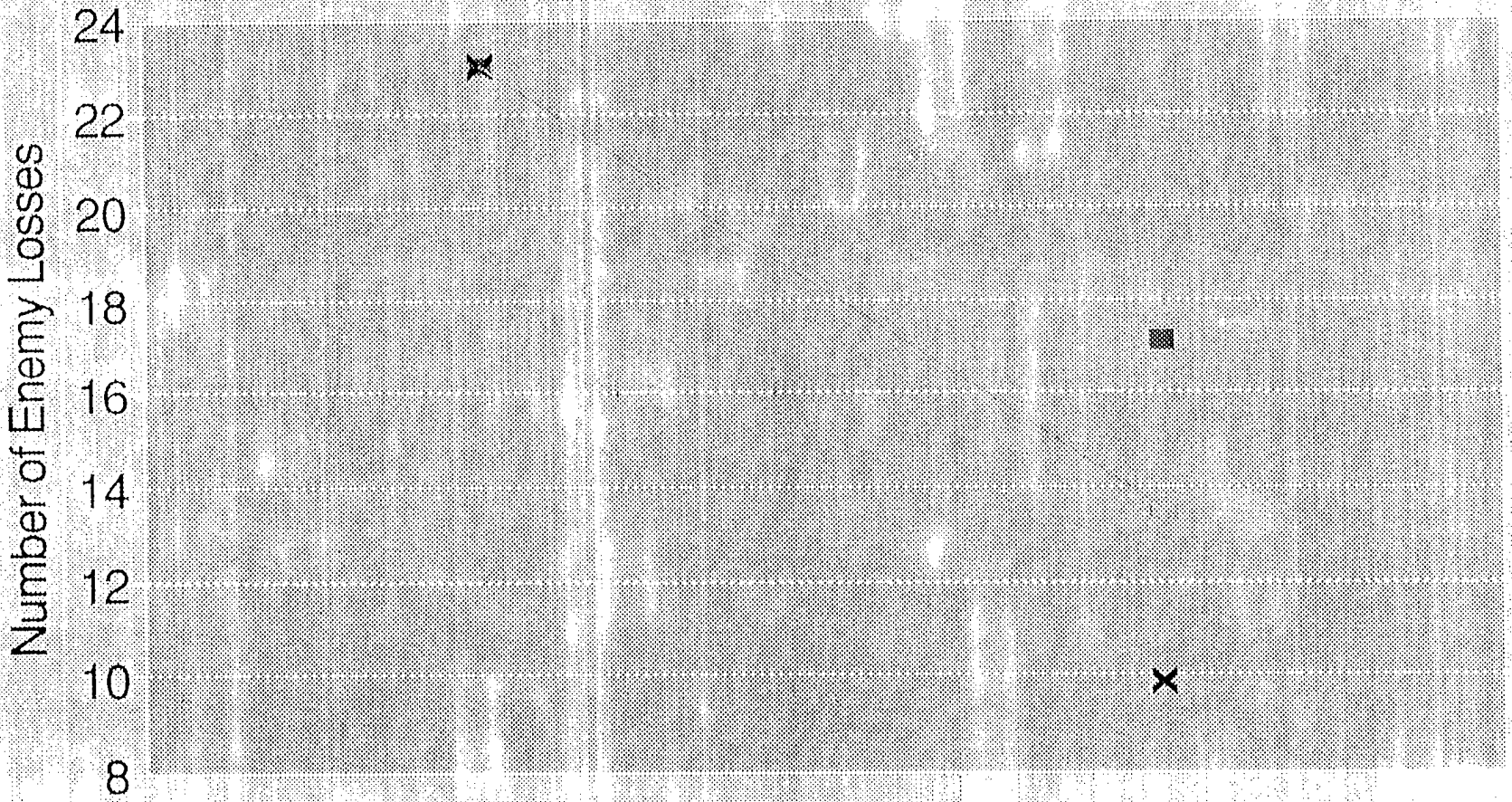
MOE #1 - Average Enemy Losses

Weapon: DP 2 & 4 (Force Set High)



MOE #1 - Average Enemy Losses

Force & Weapon: DP 1 & 4

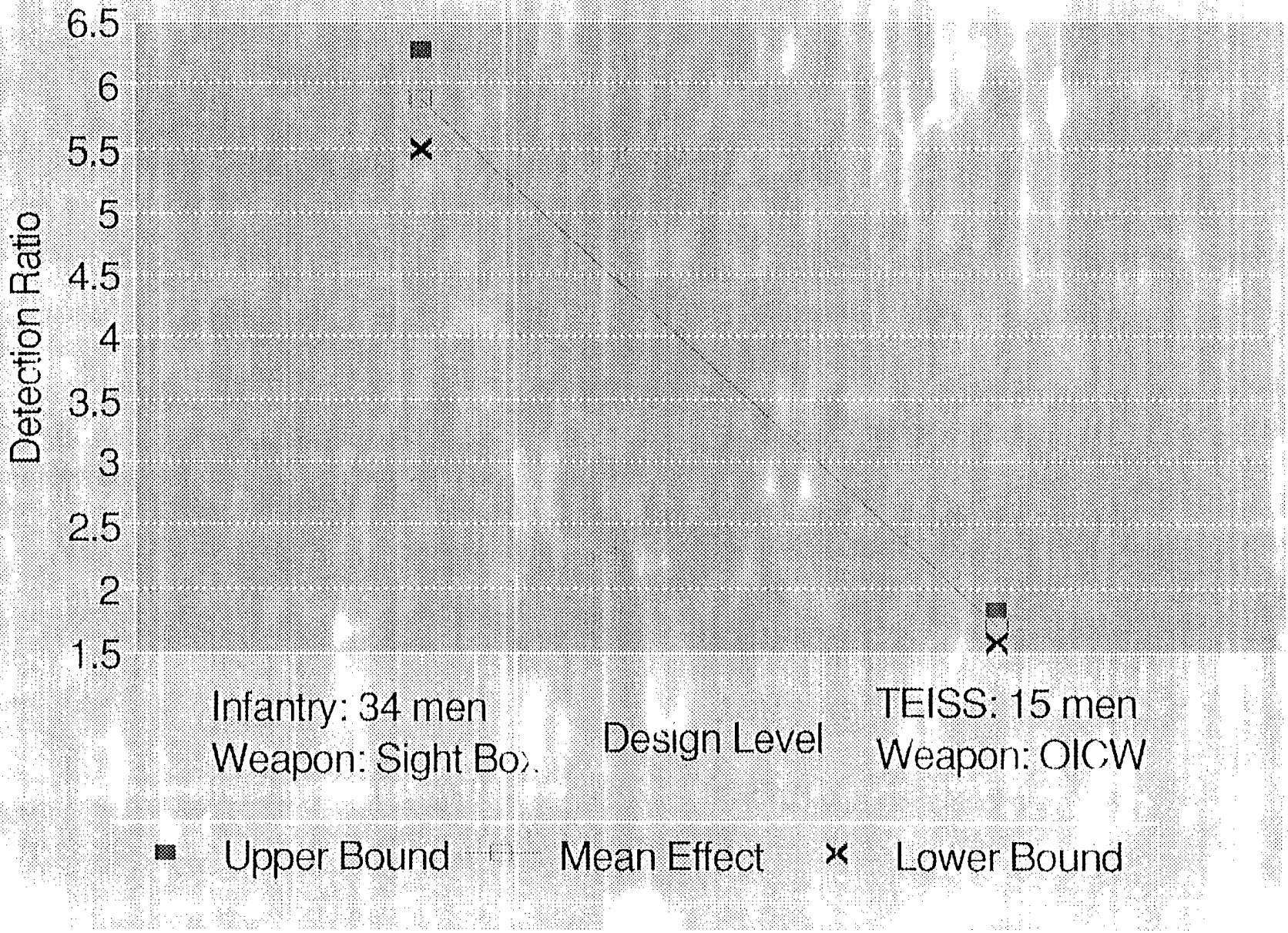


Enclosure 5

MOE Analysis for Detection Ratio

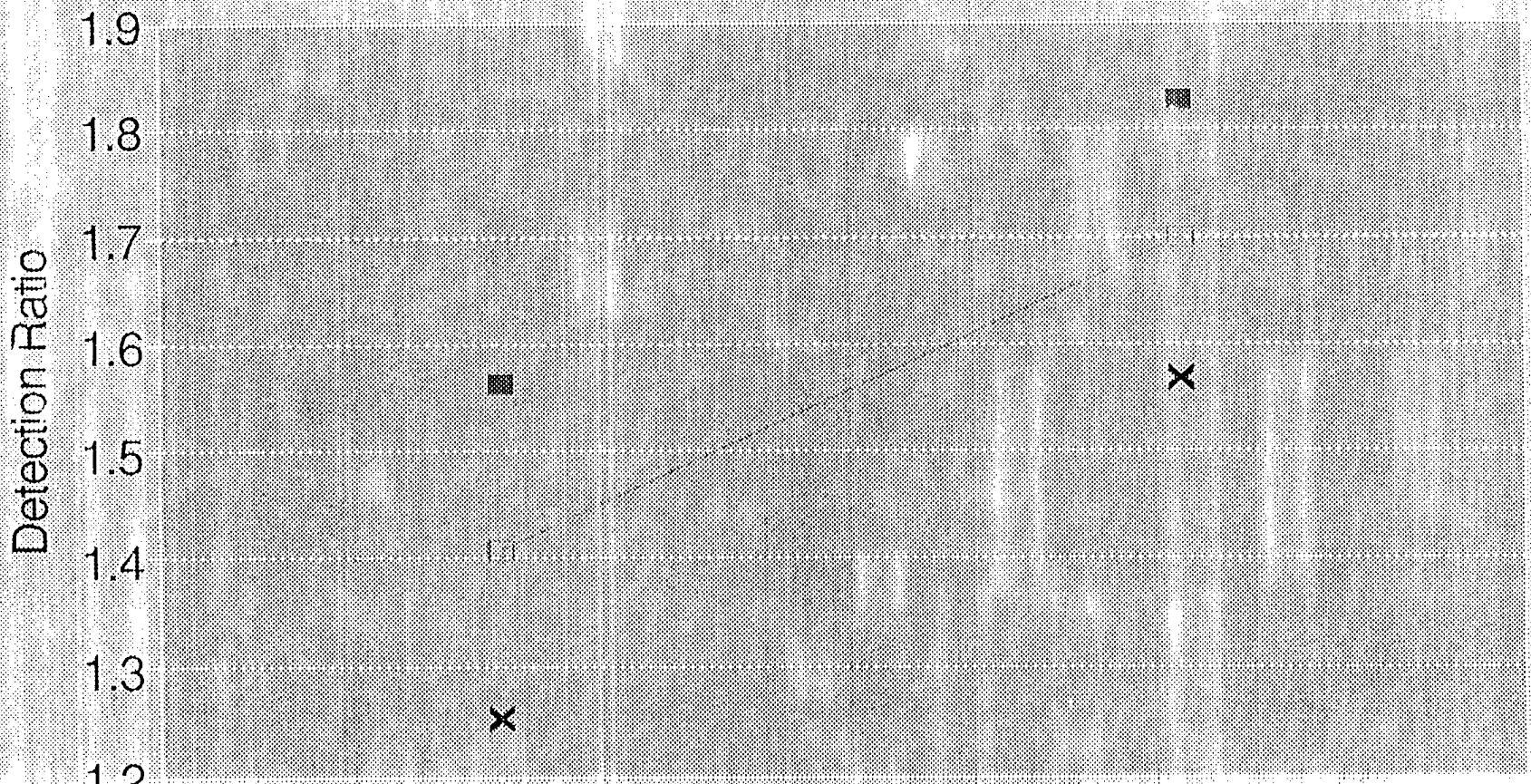
MOE #2 - Detection Ratio

Force & Weapon: DP 1 & 4



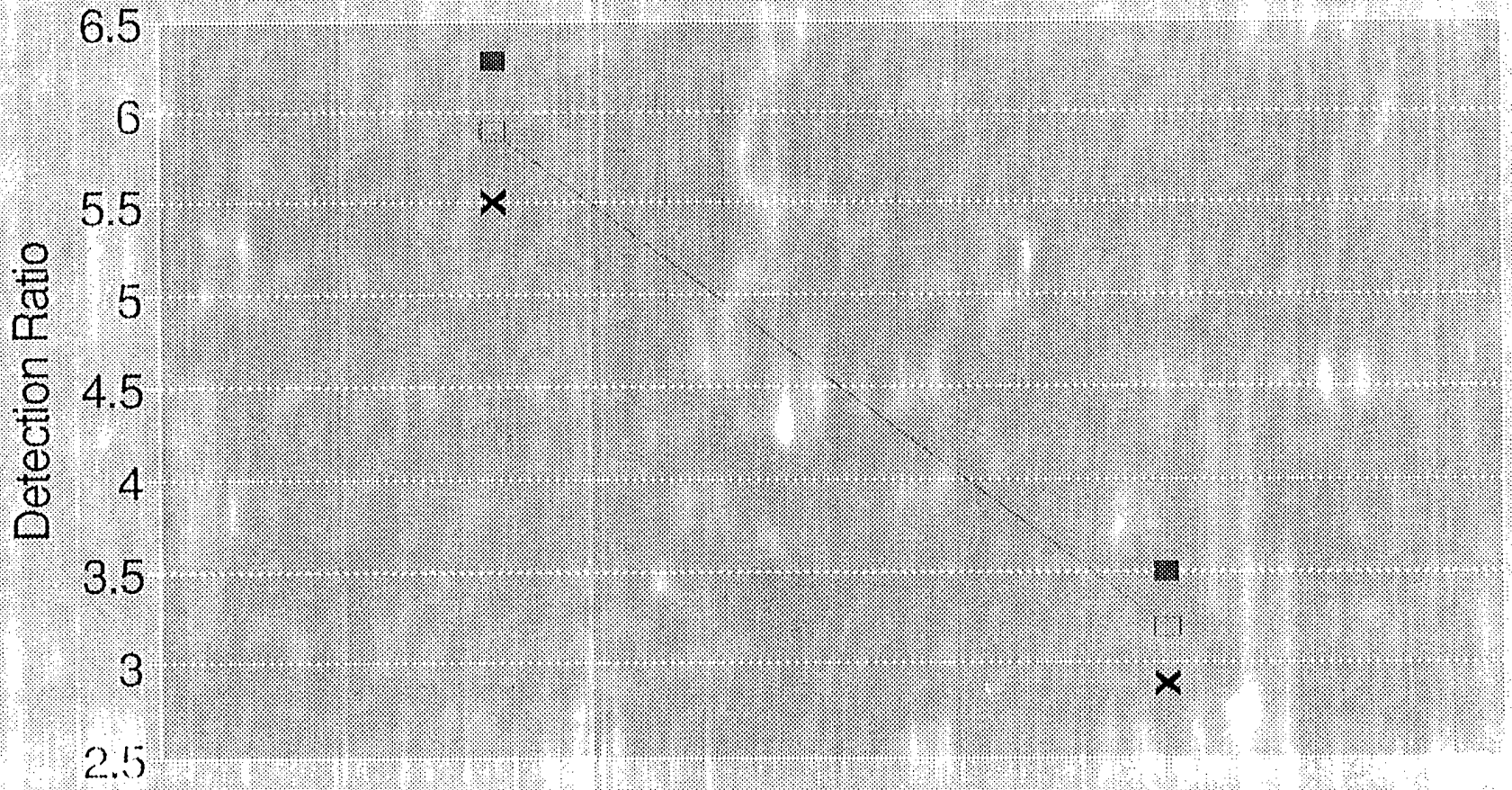
MOE #2 - Detection Ratio

Weapon: DP 2 & 4 (Force Set High)



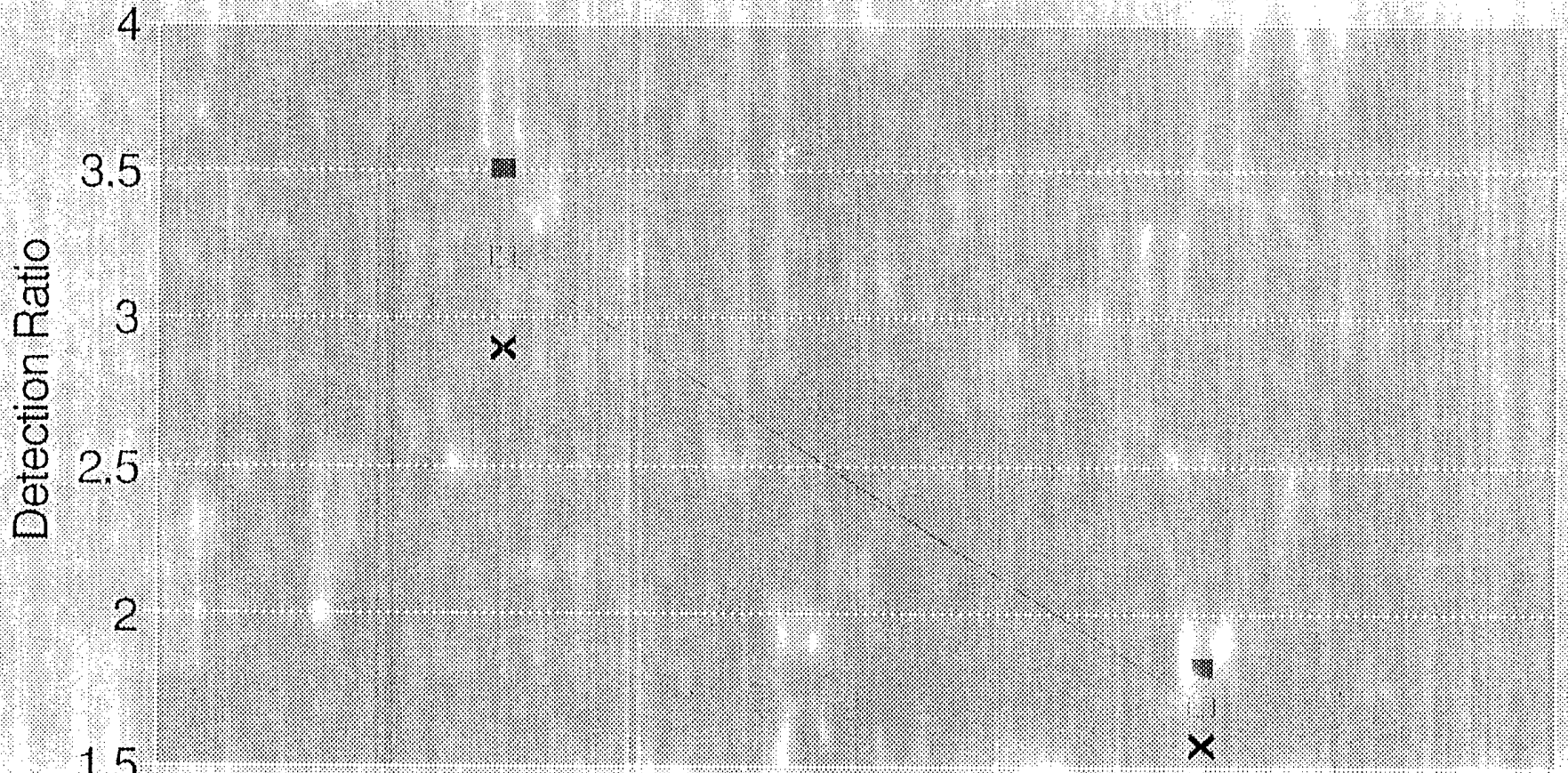
MOE #2 - Detection Ratio

Weapon: DP 1 & 3 (Force Set Low)



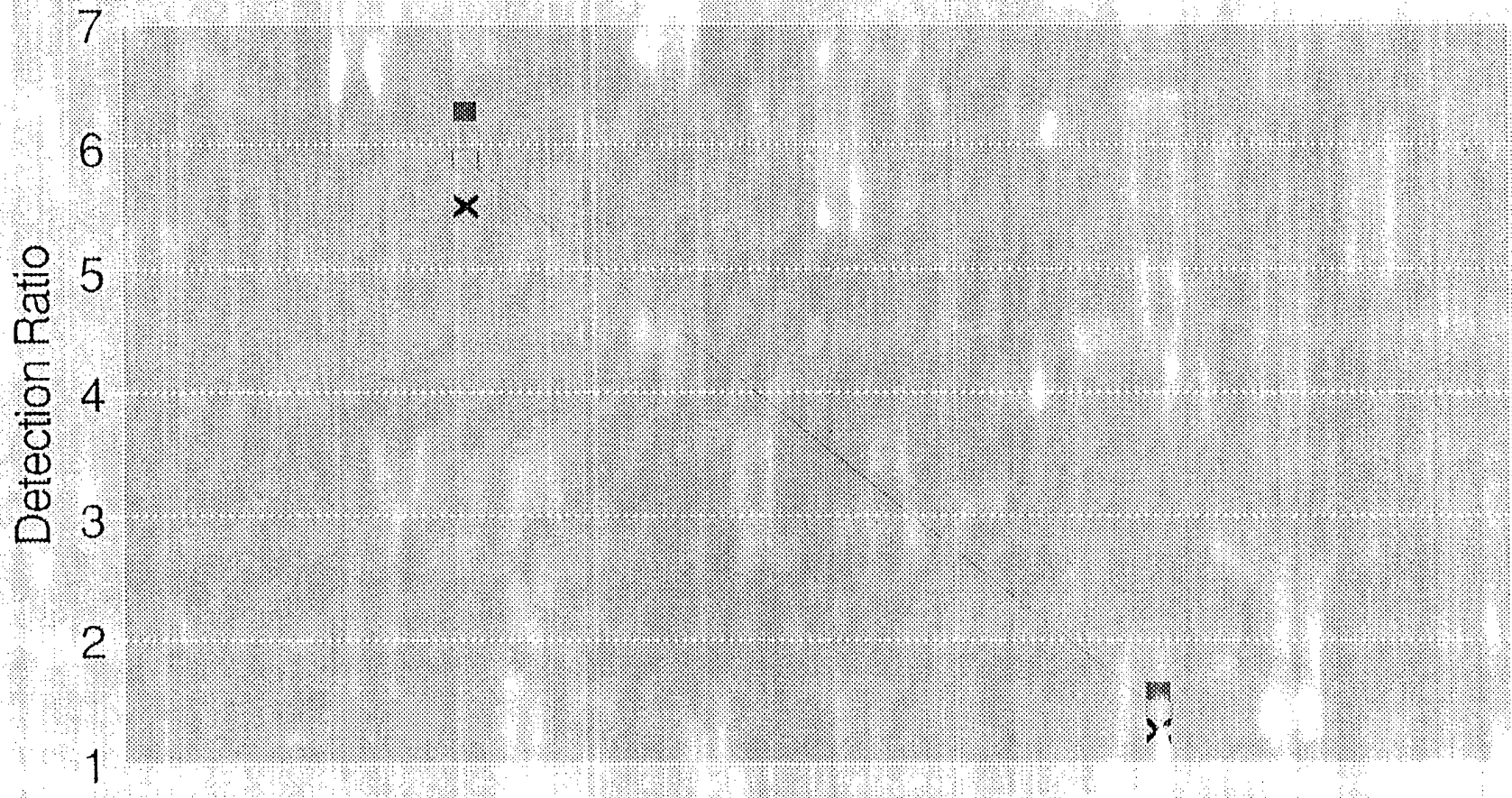
MOE #2 - Detection Ratio

Force: DP 3 & 4 (Weapon Set High)



MOE #2 - Detection Ratio

Force: DP 1 & 2 (Weapon Set Low)



MOE #2 - Detection Ratio

Constants	
k =	2
p =	1
RanNum 1 =	1693
RanNum 2 =	89525
RanNum 3 =	11149
RanNum 4 =	93953
RanNum 5 =	29983
RanNum 6 =	34972
t =	1.478
n =	4

	Low Level	High Level
Factor 1: Force	Infantry: 34 men	TEISS: 17 men
Factor 2: Weapon	Weapon: M16 with Sight Box	Weapon: OICW

DP	Force	Weapon	RandNum1 1693 Run 1	RandNum2 89525 Run 2	RandNum3 11149 Run 3	RandNum4 93953 Run 4
1	-	-	5.13	5.78	6.05	6.55
2	+	-	1.24	1.17	1.54	1.68
3	-	+	2.86	3.14	2.91	3.89
4	+	+	1.45	1.64	1.93	1.77
Total Effects:	Force		-2.65	-3.055	-2.745	-3.51
	Weapon		-1.03	-1.085	-1.375	-1.3
	Force & Weapon		1.24	1.555	1.765	1.39

Factor 1:	Force	*Factor 2:*	Weapon
Mean Effect:	-2.99	***Mean Effect:***	-1.1975
Variance:	0.150083	Variance:	0.027575
Half Length:	0.286293	Half Length:	0.122716
Upper Bound:	-2.70371	*Upper Bound:*	-1.07478
Lower Bound:	-3.27629	*Lower Bound:*	-1.32022
Significant	Yes	*Significant*	Yes

Force & Weapon	
Mean Effect:	1.4875
Variance:	0.050775
Half Length:	0.166521
Upper Bound:	1.654021
Lower Bound:	1.320979
Significant	Yes

"indf1: INDIRECT FIRE REPORT"
"SELECTED BLUE SYSTEMS"
"-VS-   ALL RED"
"RUN 21----- SCENARIO 490"
"=="
"AVERAGE OVER ALL RUNS SELECTED"
"=="
"   ROUNDS   MUNITION MUNITION"
"   SYSTEM MUNITION ROUNDS KILLS PER KILL   USAGE   CONTRIB ENDGT"
"--"
"   "60.28
"--"
"   ALL SYS   HC"   2.0   0.0   "undef"   100.0% "undef"
"   Teiss2   HC"   2.0   0.0   "undef"   100.0% "undef"
"=="
"INDIVIDUAL RUN STATISTICS"
"=="
"RUN" 21"   "60.32
"   Teiss2   HC"   2   0   "undef"   100.0% "undef"
"--"
"RUN" 22"   "60.30
"   Teiss2   HC"   2   0   "undef"   100.0% "undef"
"--"
"RUN" 23"   "60.32
"   Teiss2   HC"   2   0   "undef"   100.0% "undef"
"--"
"RUN" 24"   "60.17
"   Teiss2   HC"   2   0   "undef"   100.0% "undef"
"==

"kpersel: KILLS PER SYSTEM EMPLOYED"
"RUN 24----- SCENARIO 491"

"BLUE SYSTEMS		KILLS BY	NUMBER EMPLOYED	KILLS PER" SYSTEM EMPLOYED"
"ALL BLUE	RUN" 21	6	19	0.32
"	RUN" 22	7	19	0.37
"	RUN" 23	8	19	0.42
"	RUN" 24	10	19	0.53
"	AVERAGE"	7.75	19	0.41

"RED SYSTEMS		KILLS BY	NUMBER EMPLOYED	KILLS PER" SYSTEM EMPLOYED"
"ALL RED	RUN" 21	0	28	0.00
"	RUN" 22	0	28	0.00
"	RUN" 23	1	28	0.04
"	RUN" 24	1	28	0.04
"	AVERAGE"	0.50	28	0.02

"END GT(MIN)	RUN" 21	60.32
"	RUN" 22	60.30
"	RUN" 23	60.32
"	RUN" 24	60.17
"	AVERAGE"	60.27

"range1: DETECT/FIRE/KILL RANGE HISTOGRAM"
" ALL BLUE"
"-VS- ALL RED"
"RANGE(KM)in: RUN 21----- Scenario 490 Run:" 21RUN 22----- Scenario 490 Run

0.00	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88	0.99	1
"AVERAGE"										
"DETECTS"	0.2	0.0	0.0	0.0	0.5	1.0	2.2	11.0	15.0	1
"FIRES"	0.0	0.0	0.0	0.0	0.0	2.8	5.2	411.2	819.2	19
"KILLS"	0.0	0.0	0.0	0.0	0.0	0.0	1.0	6.8	0.0	

"ser1: SYSTEM EXCHANGE RATIO"
"RUN 24----- SCENARIO 491"

"BLUE SYSTEMS		KILLS BY	KILLS OF	SER"
"ALL BLUE	RUN" 21	6	0	"undef"
"	RUN" 22	7	0	"undef"
"	RUN" 23	8	1	8.00
"	RUN" 24	10	1	10.00
"	AVERAGE"	7.75	0.50	15.50

"RED SYSTEMS		KILLS BY	KILLS OF	SER"
"ALL RED	RUN" 21	0	6	0.00
"	RUN" 22	0	7	0.00
"	RUN" 23	1	8	0.12
"	RUN" 24	1	10	0.10
"	AVERAGE"	0.50	7.75	0.06

"END GT(MIN)	RUN" 21	60.32
"	RUN" 22	60.30
"	RUN" 23	60.32
"	RUN" 24	60.17
"	AVERAGE"	60.27

"time1: DETECT/FIRE/KILL TIME HISTOGRAM"
" ALL BLUE"
"-VS- ALL RED"

"TIME(MIN)in: RUN 21----- Scenario 490 Run:"						21RUN 22----- Scenario 490 Run				
0.00	6.50	13.00	19.50	26.00	32.50	39.00	45.50	52.00	58.50	65
"AVERAGE"										
"DETECTS"	9.8	0.0	0.2	2.5	15.8	12.5	12.2	12.5	26.0	1
"FIRES"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1298.2	13
"KILLS"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	

"time rng1: TIME VS RANGE VS DFK"
" ALL BLUE"
"-VS-   ALL RED"
"RUN 21----- Scenario 490 Run:" 21"RUN 22---- Scenario 490 Run:" 22"RUN

TIME (MIN)	DETECTIONS MEAN RANGE	DETECTIONS AVERAGE DETECTS	DF & IF FIRES MEAN DF RANGE	DF & IF FIRES AVG # DIRECT	DF & IF FIRES AVG # INDIR	DF & IF KILLS MEAN DF RANGE	DF & IF KILLS AVG # DIRECT	DF & IF KILLS MEAN IF RANGE	AV IN
0.00	0.99	9.75	0.00	0.00	0.00	0.00	0.00	0.00	0
6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
13.00	1.11	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0
19.50	2.26	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0
26.00	2.14	15.75	0.00	0.00	0.00	0.00	0.00	0.00	0
32.50	2.05	12.50	0.00	0.00	0.00	0.00	0.00	0.00	0
39.00	2.04	12.25	0.00	0.00	0.00	0.00	0.00	0.00	0
45.50	1.42	12.50	0.00	0.00	0.00	0.00	0.00	0.00	0
52.00	1.08	26.00	0.92	1296.25	2.00	0.78	6.00	0.00	0
58.50	1.03	19.75	0.91	133.00	0.00	0.78	1.75	0.00	0
65.00									

"csu1: COMBAT SYSTEM UTILIZATION"
"RUN 44----- SCENARIO 490"

"BLUE SYSTEMS		PERCENT CONTRIB	INITIAL STRENGTHS" INDIV SYS	SEL GROUP	PERCENT OF" GROUP	CSU"
"TEISSL	RUN" 41	4.54	0	0	"undef"	"undef"
"	RUN" 42	9.09	0	0	"undef"	"undef"
"	RUN" 43	27.27	0	0	"undef"	"undef"
"	RUN" 44	10.00	0	0	"undef"	"undef"
"	AVERAGE"	11.11	0	0	0.00	0.00
"TEISSS	RUN" 41	50.00	0	0	"undef"	"undef"
"	RUN" 42	18.18	0	0	"undef"	"undef"
"	RUN" 43	27.27	0	0	"undef"	"undef"
"	RUN" 44	40.00	0	0	"undef"	"undef"
"	AVERAGE"	37.04	0	0	0.00	0.00
"Teiss2	RUN" 41	45.45	0	0	"undef"	"undef"
"	RUN" 42	72.73	0	0	"undef"	"undef"
"	RUN" 43	45.45	0	0	"undef"	"undef"
"	RUN" 44	50.00	0	0	"undef"	"undef"
"	AVERAGE"	51.85	0	0	0.00	0.00
"UH-60	RUN" 41	0.00	0	0	"undef"	"undef"
"	RUN" 42	0.00	0	0	"undef"	"undef"
"	RUN" 43	0.00	0	0	"undef"	"undef"
"	RUN" 44	0.00	0	0	"undef"	"undef"
"	AVERAGE"	0.00	0	0	0.00	0.00

"RED SYSTEMS		PERCENT CONTRIB	INITIAL STRENGTHS" INDIV SYS	SEL GROUP	PERCENT OF" GROUP	CSU"
"CMDR	RUN" 41	0.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef"
"	RUN" 43	0.00	0	0	"undef"	"undef"
"	RUN" 44	0.00	0	0	"undef"	"undef"
"	AVERAGE"	0.00	0	0	0.00	0.00
"LT	RUN" 41	0.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef"
"	RUN" 43	0.00	0	0	"undef"	"undef"
"	RUN" 44	0.00	0	0	"undef"	"undef"
"	AVERAGE"	0.00	0	0	0.00	0.00
"LT MG	RUN" 41	0.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef"
"	RUN" 43	0.00	0	0	"undef"	"undef"
"	RUN" 44	0.00	0	0	"undef"	"undef"
"	AVERAGE"	0.00	0	0	0.00	0.00
"RIFLEM	RUN" 41	100.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef"
"	RUN" 43	100.00	0	0	"undef"	"undef"
"	RUN" 44	0.00	0	0	"undef"	"undef"
"	AVERAGE"	66.67	0	0	0.00	0.00
"SVD	RUN" 41	0.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef"
"	RUN" 43	0.00	0	0	"undef"	"undef"
"	RUN" 44	100.00	0	0	"undef"	"undef"
"	AVERAGE"	33.33	0	0	0.00	0.00
"Trk	RUN" 41	0.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef"

"	RUN" 43	0.00	0	0	"undef"	"undef"
"	RUN" 44	0.00	0	0	"undef"	"undef"
"	AVERAGE"	0.00	0	0	0.00	0.00
"Trk Ut	RUN" 41	0.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef
"	RUN" 43	0.00	0	0	"undef"	"undef"
"	RUN" 44	0.00	0	0	"undef"	"undef"
"	AVERAGE"	0.00	0	0	0.00	0.00
"ZODIAC	RUN" 41	0.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef"
"	RUN" 43	0.00	0	0	"undef"	"undef"
"	RUN" 44	0.00	0	0	"undef"	"undef"
"	AVERAGE"	0.00	0	0	0.00	0.00

"detect1: DETECTION RATIO"
" ALL BLUE"
"-VS- ALL RED"
"RUN 41----- SCENARIO 190"

"RUN	BLUE DETECTS RED	RED DETECTS BLUE	DETECTION RATIO	END GT"
41	175	121	1.45	60.32
42	125	76	1.64	59.75
43	145	75	1.93	60.33
44	147	83	1.77	60.30
"AVG"	148.00	88.75	1.67	60.17

"dfkch1: DETECT/FIRE/KILL TOTALS CHART"
" ALL BLUE"
"-VS- ALL RED"
"RUN 41----- Scenario 490 RUN"

	41	42	43	44
"TOTAL"				
"DETECTS"	175.00	125.00	145.00	147.00
"FIRES"	393.00	420.00	350.00	372.00
"KILLS"	22	11	11	10

"dfktal: DETECT/FIRE/KILL AVERAGES"
" ALL BLUE"
"-VS- ALL RED"
"RUN 41----- SCENARIO 490"

	DETECTS	FIRINGS		KILLS			AVERAGE RANGES				
							DETECT	FIRINGS	KILLS		
RUN		DF	IF	DF	IF	MINE		DF only	DF	IF	EN
41	175	391	0	22	0	0	1.263	0.845	0.548	0.000	6
42	125	418	2	11	0	0	1.469	0.893	0.773	0.000	5
43	145	348	2	11	0	0	1.449	0.889	0.768	0.000	6
44	147	370	2	10	0	0	1.395	0.890	0.771	0.000	6
TOT	592	1527	6	54	0	0					
AVG	148.0	381.8	1.5	13.5	0.0	0.0	1.385	0.879	0.680	0.000	6
SDV	20.6	29.9	1.0	5.7	0.0	0.0	0.093	0.023	0.118	0.000	
95% CONFIDENCE INTERVALS (NORMAL DISTRIBUTION)											
LOW	107.7	323.2	0.0	2.4	0.0	0.0	1.202	0.834	0.448	0.000	5
UPP	188.3	440.3	3.4	24.6	0.0	0.0	1.568	0.924	0.912	0.000	6

"fer1: FORCE EXCHANGE RATIO"
" ALL BLUE"
"-VS- ALL RED"
"RUN 41----- SCENARIO 100"

"RUN	RED LOSSES	BLUE" BLUE LOSSES	LER	INIT RED	INIT BLUE	IFR	FER	EN
41	22	1	22.00	0	0	0.00	"undef"	60.32
42	11	0	0.00	0	0	0.00	"undef"	59.75
43	11	1	11.00	0	0	0.00	"undef"	60.33
44	10	1	10.00	0	0	0.00	"undef"	60.30
"AVG"	13.50	0.75	18.00	0	0	0.00	"undef"	60.17

"indf1: INDIRECT FIRE REPORT"
"SELECTED BLUE SYSTEMS"
"-VS-   ALL RED"
"RUN 41----- SCENARIO 490"

"AVERAGE OVER ALL RUNS SELECTED"

SYSTEM	MUNITION	ROUNDS	KILLS	ROUNDS PER KILL	MUNITION USAGE	MUNITION CONTRIB	ENDGT
							60.17
ALL SYS	HC	2.0	0.0	"undef"	100.0%	"undef"	
Teiss2	HC	2.0	0.0	"undef"	100.0%	"undef"	

"INDIVIDUAL RUN STATISTICS"

"RUN" 41"							60.32
Teiss2	HC	2	0	"undef"	100.0%	"undef"	
"RUN" 42"							59.75
Teiss2	HC	2	0	"undef"	100.0%	"undef"	
"RUN" 43"							60.33
Teiss2	HC	2	0	"undef"	100.0%	"undef"	
"RUN" 44"							60.30
Teiss2	HC	2	0	"undef"	100.0%	"undef"	

"kpersel: KILLS PER SYSTEM EMPLOYED"
"RUN 44----- SCENARIO 490"

"BLUE SYSTEMS		KILLS BY	NUMBER EMPLOYED	KILLS PER" SYSTEM EMPLOYED"
"ALL BLUE	RUN" 41	22	0	"undef"
"	RUN" 42	11	0	"undef"
"	RUN" 43	11	0	"undef"
"	RUN" 44	10	0	"undef"
"	AVERAGE"	13.50	0	"undef"

"RED SYSTEMS		KILLS BY	NUMBER EMPLOYED	KILLS PER" SYSTEM EMPLOYED"
"ALL RED	RUN" 41	1	0	"undef"
"	RUN" 42	0	0	"undef"
"	RUN" 43	1	0	"undef"
"	RUN" 44	1	0	"undef"
"	AVERAGE"	0.75	0	"undef"

"END GT(MIN)	RUN" 41	60.32
"	RUN" 42	59.75
"	RUN" 43	60.33
"	RUN" 44	60.30
"	AVERAGE"	60.17

"range1: DETECT/FIRE/KILL RANGE HISTOGRAM"
" ALL BLUE"
"-VS- ALL RED"
"RANGE(KM)in: RUN 41----- Scenario 490 Run:" 41RUN 42----- Scenario 490 Run

0.00	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88	0.99	1
"AVERAGE"										
"DETECTS"	0.5	0.0	0.0	0.5	0.5	1.0	3.2	22.0	25.8	1
"FIRES"	0.0	0.0	0.5	6.5	1.2	0.8	18.8	142.8	198.0	1
"KILLS"	0.0	0.0	0.0	2.8	0.5	0.0	4.2	6.0	0.0	

"ser1: SYSTEM EXCHANGE RATIO"
"RUN 44----- SCENARIO 490"

"BLUE SYSTEMS		KILLS BY	KILLS OF	SER"
"ALL BLUE	RUN" 41	22	1	22.00
"	RUN" 42	11	0	"undef"
"	RUN" 43	11	1	11.00
"	RUN" 44	10	1	10.00
"	AVERAGE"	13.50	0.75	18.00

"RED SYSTEMS		KILLS BY	KILLS OF	SER"
"ALL RED	RUN" 41	1	22	0.04
"	RUN" 42	0	11	0.00
"	RUN" 43	1	11	0.09
"	RUN" 44	1	10	0.10
"	AVERAGE"	0.75	13.50	0.06

"END GT(MIN)	RUN" 41	60.32
"	RUN" 42	59.75
"	RUN" 43	60.33
"	RUN" 44	60.30
"	AVERAGE"	60.17

"time1: DETECT/FIRE/KILL TIME HISTOGRAM"
" ALL BLUE"
"-VS- ALL RED"
"TIME(MIN)in: RUN 41----- Scenario 490 Run:" 41RUN 42----- Scenario 490 Run

	0.00	8.00	16.00	24.00	32.00	40.00	48.00	56.00	64.00	72.00	80
"AVERAGE"											
"DETECTS"	9.0	0.0	0.5	17.8	16.2	14.2	22.5	67.8	0.0		
"FIRES"	0.0	0.0	0.0	0.0	0.0	0.0	83.2	300.5	0.0		
"KILLS"	0.0	0.0	0.0	0.0	0.0	0.0	5.2	8.2	0.0		

"time2: DETECT/FIRE/KILL TIME HISTOGRAM"
" ALL BLUE"
"-VS-   ALL RED"

"TIME(MIN)in: RUN 41----- Scenario 490 Run:"						41RUN 42----- Scenario 490				
	0.00	6.50	13.00	19.50	26.00	32.50	39.00	45.50	52.00	58.50	
"AVERAGE"											
"DETECTS"	9.0	0.0	0.2	2.5	16.0	13.2	12.8	14.8	58.8	2	
"FIRES"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	338.5	4	
"KILLS"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0		

"time rng2: TIME VS RANGE VS DFK"
" ALL BLUE"
"-VS- ALL RED"
'RUN 41----- Scenario 490 Run:" 41"RUN 42----- Scenario 490 Run:" 42"RUN 43

" TIME (MIN)	DETECTIONS MEAN RANGE	DETECTIONS AVERAGE DETECTS	DF & IF FIRES MEAN DF RANGE	DF & IF FIRES AVG # DIRECT	DF & IF FIRES AVG # INDIR	DF & IF KILLS MEAN DF RANGE	DF & IF KILLS AVG # DIRECT	DF & IF KILLS MEAN IF RANGE	AV IN
0.00	0.95	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0
6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
13.00	1.11	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0
19.50	2.36	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0
26.00	2.14	16.00	0.00	0.00	0.00	0.00	0.00	0.00	0
32.50	2.05	13.25	0.00	0.00	0.00	0.00	0.00	0.00	0
39.00	1.95	12.75	0.00	0.00	0.00	0.00	0.00	0.00	0
45.50	1.26	14.75	0.00	0.00	0.00	0.00	0.00	0.00	0
52.00	1.03	58.75	0.88	336.50	2.00	0.67	12.00	0.00	0
58.50	1.19	20.75	0.89	45.25	0.00	0.79	1.50	0.00	0
65.00									

"csu1: COMBAT SYSTEM UTILIZATION"
"RUN82------ SCENARIO 489"

"BLUE SYSTEMS		PERCENT CONTRIB	INITIAL STRENGTHS" INDIV SYS	SEL GROUP	PERCENT OF" GROUP	CSU"
"TEISSL	RUN" 12	0.00	0	0	"undef"	"undef"
"	RUN" 22	30.00	0	0	"undef"	"undef"
"	RUN" 32	0.00	0	0	"undef"	"undef"
"	RUN" 42	0.00	0	0	"undef"	"undef"
"	RUN" 52	10.00	0	0	"undef"	"undef"
"	RUN" 62	10.00	0	0	"undef"	"undef"
"	RUN" 72	0.00	0	0	"undef"	"undef
"	RUN" 82	0.00	0	0	"undef"	"undef"
"	AVERAGE"	6.25	0	0	0.00	0.00
"TEISSS	RUN" 12	80.00	0	0	"undef"	"undef"
"	RUN" 22	40.00	0	0	"undef"	"undef"
"	RUN" 32	50.00	0	0	"undef"	"undef"
"	RUN" 42	60.00	0	0	"undef"	"undef"
"	RUN" 52	30.00	0	0	"undef"	"undef"
"	RUN" 62	40.00	0	0	"undef"	"undef"
"	RUN" 72	60.00	0	0	"undef"	"undef"
"	RUN" 82	60.00	0	0	"undef"	"undef"
"	AVERAGE"	52.50	0	0	0.00	0.00
"Teiss2	RUN" 12	20.00	0	0	"undef"	"undef"
"	RUN" 22	30.00	0	0	"undef"	"undef"
"	RUN" 32	50.00	0	0	"undef"	"undef"
"	RUN" 42	40.00	0	0	"undef"	"undef"
"	RUN" 52	60.00	0	0	"undef"	"undef"
"	RUN" 62	50.00	0	0	"undef"	"undef"
"	RUN" 72	40.00	0	0	"undef"	"undef"
"	RUN" 82	40.00	0	0	"undef"	"undef"
"	AVERAGE"	41.25	0	0	0.00	0.00

"RED SYSTEMS		PERCENT CONTRIB	INITIAL STRENGTHS" INDIV SYS	SEL GROUP	PERCENT OF" GROUP	CSU"
"CMDR	RUN" 12	"undef"	0	0	"undef"	"undef"
"	RUN" 22	0.00	0	0	"undef"	"undef"
"	RUN" 32	0.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef"
"	RUN" 52	0.00	0	0	"undef"	"undef"
"	RUN" 62	0.00	0	0	"undef"	"undef"
"	RUN" 72	"undef"	0	0	"undef"	"undef"
"	RUN" 82	"undef"	0	0	"undef"	"undef"
"	AVERAGE"	0.00	0	0	0.00	0.00
"LT	RUN" 12	"undef"	0	0	"undef"	"undef"
"	RUN" 22	0.00	0	0	"undef"	"undef"
"	RUN" 32	0.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef"
"	RUN" 52	0.00	0	0	"undef"	"undef"
"	RUN" 62	0.00	0	0	"undef"	"undef"
"	RUN" 72	"undef"	0	0	"undef"	"undef"
"	RUN" 82	"undef"	0	0	"undef"	"undef"
"	AVERAGE"	0.00	0	0	0.00	0.00
"LT MG	RUN" 12	"undef"	0	0	"undef"	"undef"
"	RUN" 22	0.00	0	0	"undef"	"undef
"	RUN" 32	0.00	0	0	"undef"	"undef"
"	RUN" 42	"undef"	0	0	"undef"	"undef"
"	RUN" 52	0.00	0	0	"undef"	"undef"
"	RUN" 62	0.00	0	0	"undef"	"undef"

"detect1: DETECTION RATIO"
" ALL BLUE"
"-VS-   ALL RED"
"RUN12------ SCENARIO 489"

"RUN	BLUE DETECTS RED	RED DETECTS BLUE	DETECTION RATIO	END GT"
12	40	13	3.08	28.00
22	46	15	3.07	29.50
32	40	10	4.00	25.52
42	37	10	3.70	23.73
52	43	17	2.53	25.43
62	39	12	3.25	29.42
72	30	9	3.33	23.90
82	34	9	3.78	0.00
"AVG"	38.62	11.88	3.25	23.19

"dfkch1: DETECT/FIRE/KILL TOTALS CHART"
" ALL BLUE"
"-VS- ALL RED"
"RUN12------ Scenario 489 RUN"

	12	22	32	42	52	62	72	82
"TOTAL"								
"DETECTS"	40.00	46.00	40.00	37.00	43.00	39.00	30.00	34.00
"FIRES"	17.00	31.00	23.00	25.00	21.00	29.00	27.00	4.00
"KILLS"	10	10	10	10	10	10	10	10

"csu1: COMBAT SYSTEM UTILIZATION"
"RUN 14----- SCENARIO 490"

'BLUE SYSTEMS		PERCENT CONTRIB	INITIAL STRENGTHS" INDIV SYS	SEL GROUP	PERCENT OF" GROUP	CSU"
"CSOL_2	RUN" 11	21.74	6	36	16.67	1.30
"	RUN" 12	17.39	6	36	16.67	1.04
"	RUN" 13	17.39	6	36	16.67	1.04
"	RUN" 14	4.54	6	36	16.67	0.27
"	AVERAGE"	15.38	6	36	16.67	0.92
"CSOL_L	RUN" 11	4.35	2	36	5.56	0.78
"	RUN" 12	4.35	2	36	5.56	0.78
"	RUN" 13	8.70	2	36	5.56	1.56
"	RUN" 14	4.54	2	36	5.56	0.82
"	AVERAGE"	5.49	2	36	5.56	0.99
"CSOL_M	RUN" 11	13.04	2	36	5.56	2.35
"	RUN" 12	13.04	2	36	5.56	2.35
"	RUN" 13	21.74	2	36	5.56	3.91
"	RUN" 14	13.64	2	36	5.56	2.45
"	AVERAGE"	15.38	2	36	5.56	2.76
"CSOL_R	RUN" 11	56.52	16	36	44.44	1.27
"	RUN" 12	56.52	16	36	44.44	1.27
"	RUN" 13	39.13	16	36	44.44	0.88
"	RUN" 14	63.64	16	36	44.44	1.43
"	AVERAGE"	53.85	16	36	44.44	1.21
"CSOL_S	RUN" 11	4.35	6	36	16.67	0.26
"	RUN" 12	8.70	6	36	16.67	0.52
"	RUN" 13	13.04	6	36	16.67	0.78
"	RUN" 14	13.64	6	36	16.67	0.82
"	AVERAGE"	9.89	6	36	16.67	0.60
"UH-60	RUN" 11	0.00	4	36	11.11	0.00
"	RUN" 12	0.00	4	36	11.11	0.00
"	RUN" 13	0.00	4	36	11.11	0.00
"	RUN" 14	0.00	4	36	11.11	0.00
"	AVERAGE"	0.00	4	36	11.11	0.00

"RED SYSTEMS		PERCENT CONTRIB	INITIAL STRENGTHS" INDIV SYS	SEL GROUP	PERCENT OF" GROUP	CSU"
"CMDR	RUN" 11	0.00	2	28	7.14	0.00
"	RUN" 12	0.00	2	28	7.14	0.00
"	RUN" 13	"undef"	2	28	7.14	"undef"
"	RUN" 14	"undef"	2	28	7.14	"undef"
"	AVERAGE"	0.00	2	28	7.14	0.00
"LT	RUN" 11	0.00	8	28	28.57	0.00
"	RUN" 12	0.00	8	28	28.57	0.00
"	RUN" 13	"undef"	8	28	28.57	"undef"
"	RUN" 14	"undef"	8	28	28.57	"undef"
"	AVERAGE"	0.00	8	28	28.57	0.00
"LT MG	RUN" 11	0.00	0	28	0.00	"undef"
"	RUN" 12	0.00	0	28	0.00	"undef"
"	RUN" 13	"undef"	0	28	0.00	"undef"
"	RUN" 14	"undef"	0	28	0.00	"undef"
"	AVERAGE"	0.00	0	28	0.00	0.00
"RIFLEM	RUN" 11	100.00	11	28	39.28	2.54
"	RUN" 12	0.00	11	28	39.28	0.00

"	RUN" 13	"undef"	11	28	39.28	"undef"
"	RUN" 14	"undef"	11	28	39.28	"undef"
"	AVERAGE"	50.00	11	28	39.28	0.64
"SVD	RUN" 11	0.00	4	28	14.28	0.0
"	RUN" 12	100.00	4	28	14.28	7.0
"	RUN" 13	"undef"	4	28	14.28	"undef
"	RUN" 14	"undef"	4	28	14.28	"undef"
"	AVERAGE"	50.00	4	28	14.28	1.75
"Trk	RUN" 11	0.00	2	28	7.14	0.00
"	RUN" 12	0.00	2	28	7.14	0.00
"	RUN" 13	"undef"	2	28	7.14	"undef"
"	RUN" 14	"undef"	2	28	7.14	"undef"
"	AVERAGE"	0.00	2	28	7.14	0.00
"Trk Ut	RUN" 11	0.00	0	28	0.00	"undef"
"	RUN" 12	0.00	0	28	0.00	"undef"
"	RUN" 13	"undef"	0	28	0.00	"undef"
"	RUN" 14	"undef"	0	28	0.00	"undef"
"	AVERAGE"	0.00	0	28	0.00	0.00
"ZODIAC	RUN" 11	0.00	1	28	3.57	0.00
"	RUN" 12	0.00	1	28	3.57	0.00
"	RUN" 13	"undef"	1	28	3.57	"undef"
"	RUN" 14	"undef"	1	28	3.57	"undef"
"	AVERAGE"	0.00	1	28	3.57	0.00

Enclosure 6

MOE Analysis
for 1/(Friendly rounds fired/ Enemy Killed / Friendly systems involved)

MOE #3 - 1 / (Friendly Rounds / Enemy Killed / Friendly Systems)

Constants	
k =	2
p =	1
RanNum 1 =	1693
RanNum 2 =	89525
RanNum 3 =	11149
RanNum 4 =	93953
RanNum 5 =	29983
RanNum 6 =	34972
t =	1.478
n =	4

	Low Level	High Level
Factor 1: Force	Infantry: 34 men	TEISS: 17 men
Factor 2: Weapon	Weapon: M16 with Sight Box	Weapon: CICW

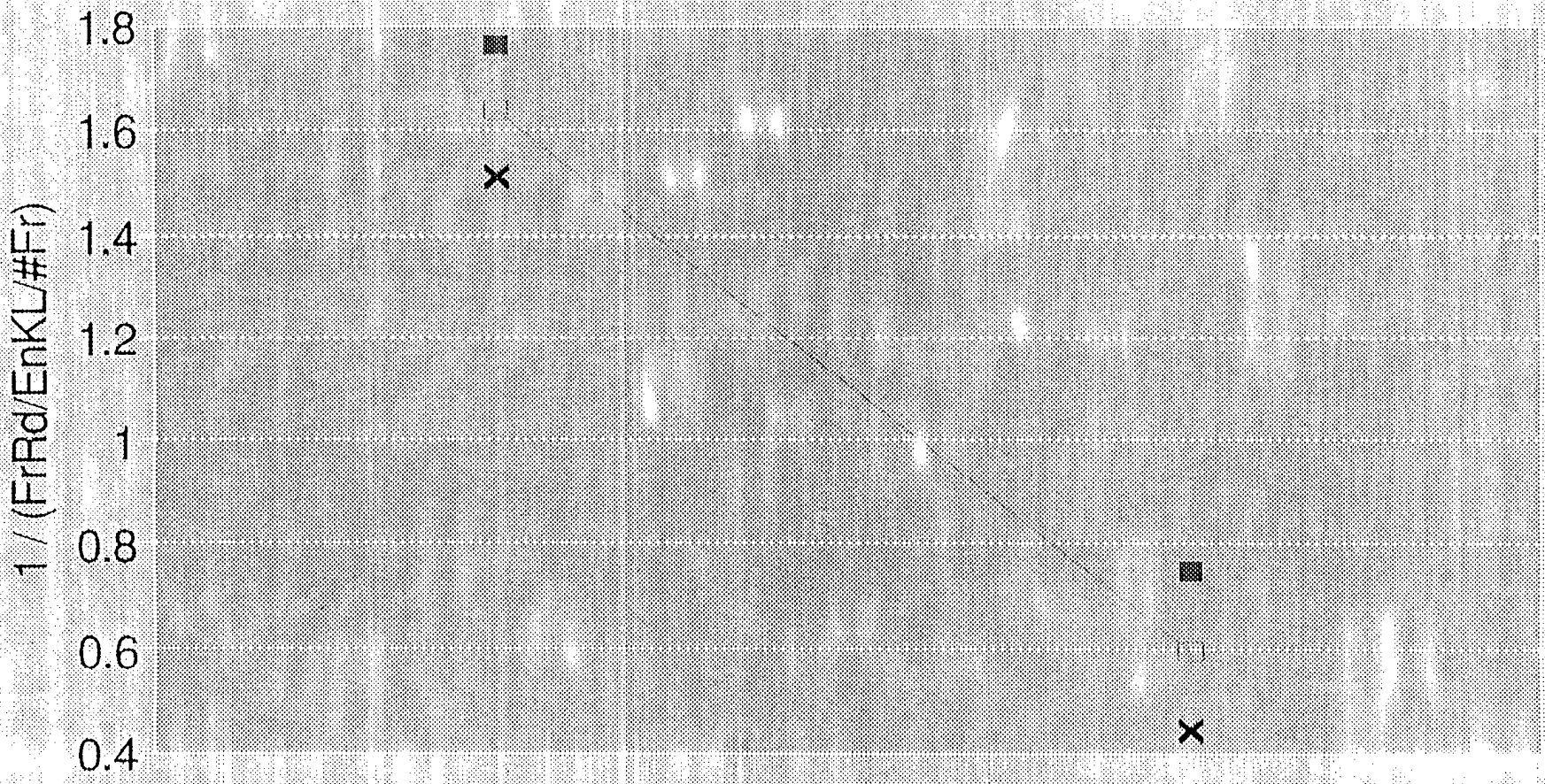
DP	Force	Weapon	RandNum1 1693 Run 1	RandNum2 89525 Run 2	RandNum3 11149 Run 3	RandNum4 93953 Run 4
1	-	-	1.5546719682	2.031169	2.010283	1.496
2	+	-	0.0699588477	0.081675	0.093858	0.124908
3	-	+	1.6638297872	1.902098	1.508318	1.464419
4	+	+	0.951653944	0.445238	0.534286	0.456989
Total Effects:	Force		-1.098444482	-1.70318	-1.44523	-1.18926
	Weapon		0.4954264577	0.117246	-0.03077	0.15025
	Force & Weapon		0.3862686386	0.246317	0.471196	0.181831

Factor 1:	Force	*Factor 2:*	Weapon
Mean Effect:	-1.35603	***Mean Effect:***	0.183039
Variance:	0.074198	**Variance:**	0.049568
Half Length:	0.201298	**Half Length:**	0.16453
Upper Bound:	-1.15773	***Upper Bound:***	0.347568
Lower Bound:	-1.56033	***Lower Bound:***	0.018509
Significant	Yes	***Significant***	Yes

Force & Weapon	
Mean Effect:	0.321403
Variance:	0.017255
Half Length:	0.097073
Upper Bound:	0.418476
Lower Bound:	0.224331
Significant	Yes

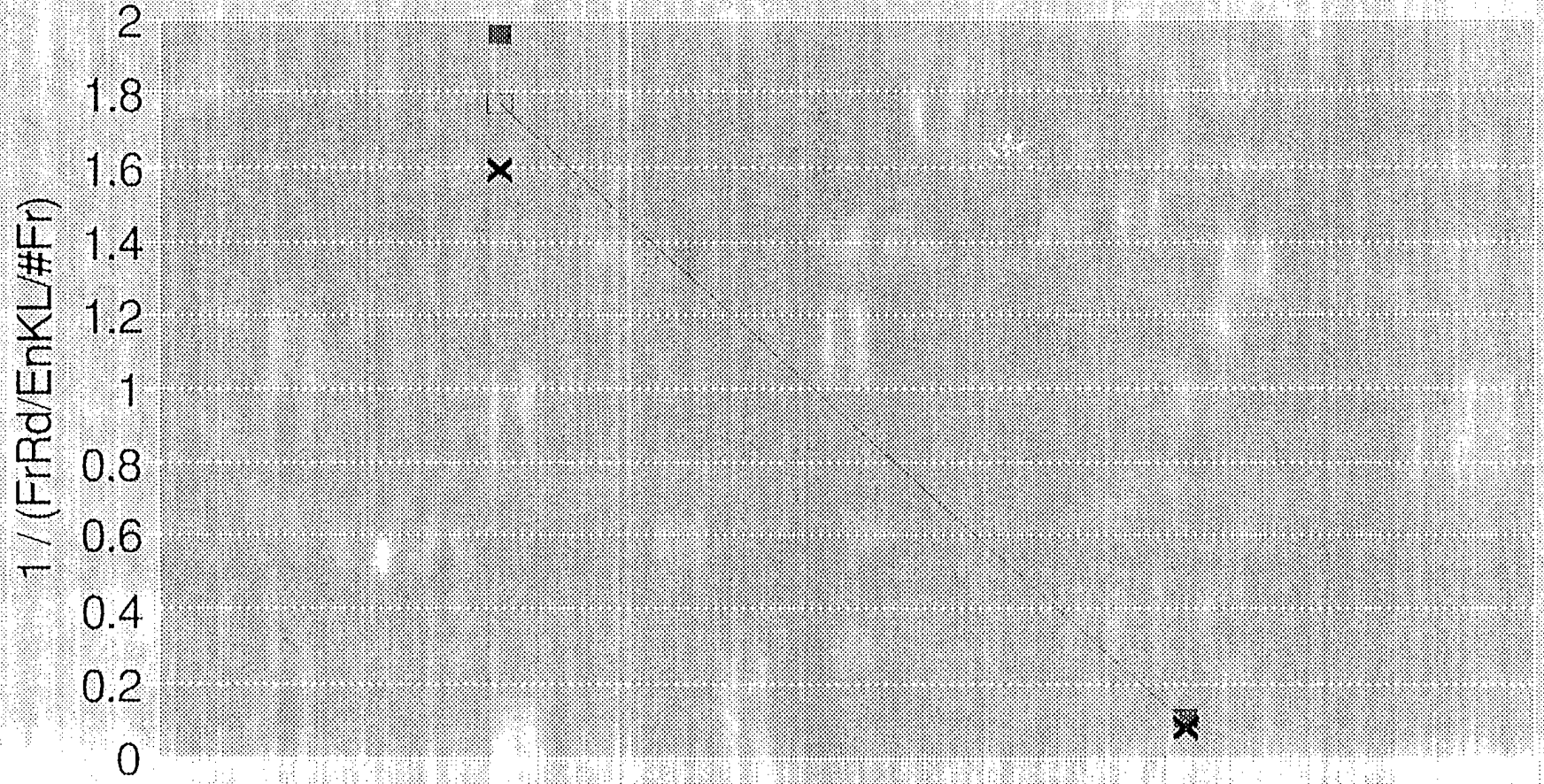
MOE #3 - 1 / (Friendly Rounds / Enemy Killed /

Force: DP 3 & 4 (Weapon Set High)



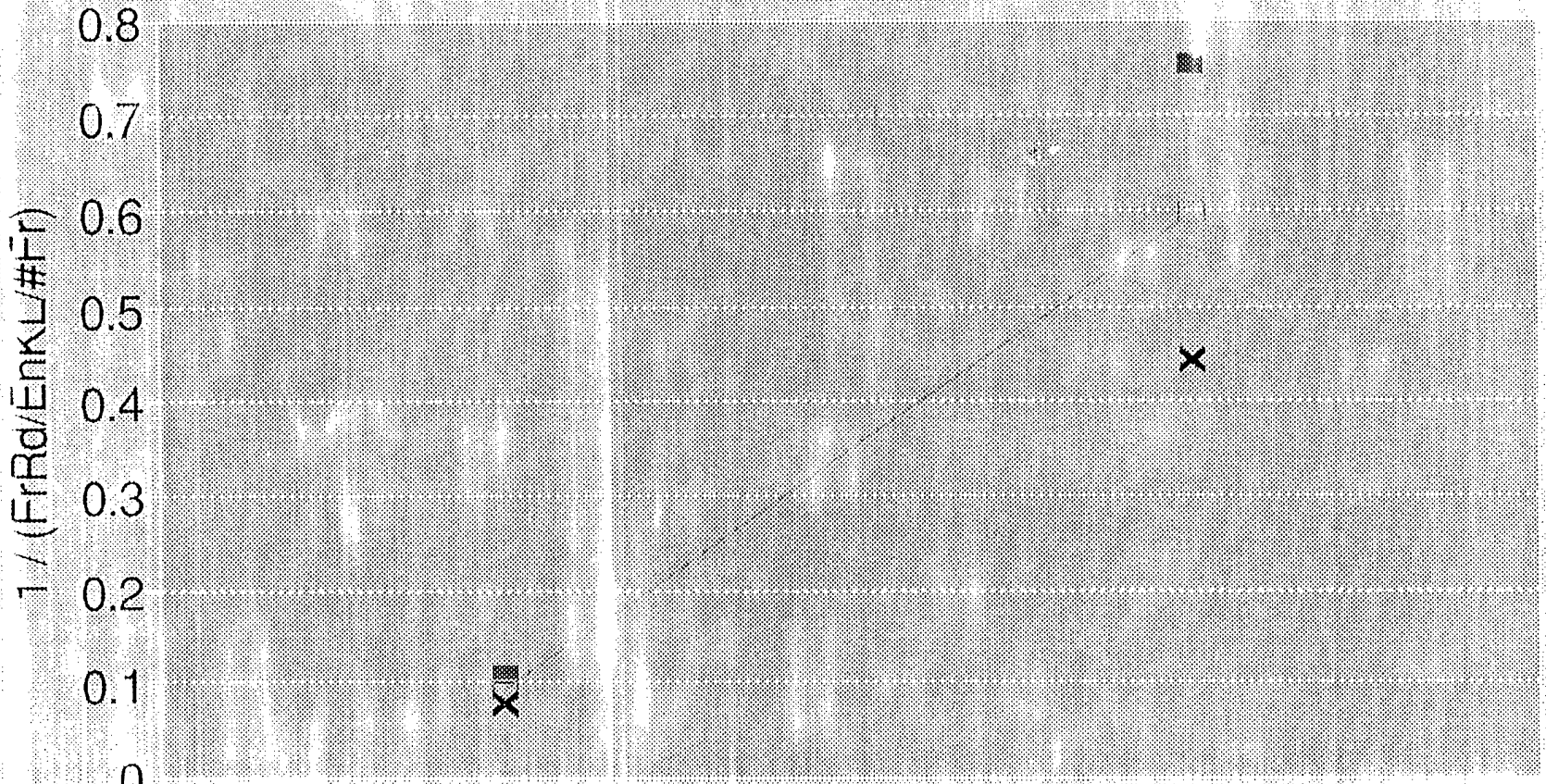
MOE #3 - 1 / (Friendly Rounds / Enemy Killed /

Force: DP 1 & 2 (Weapon Set Low)



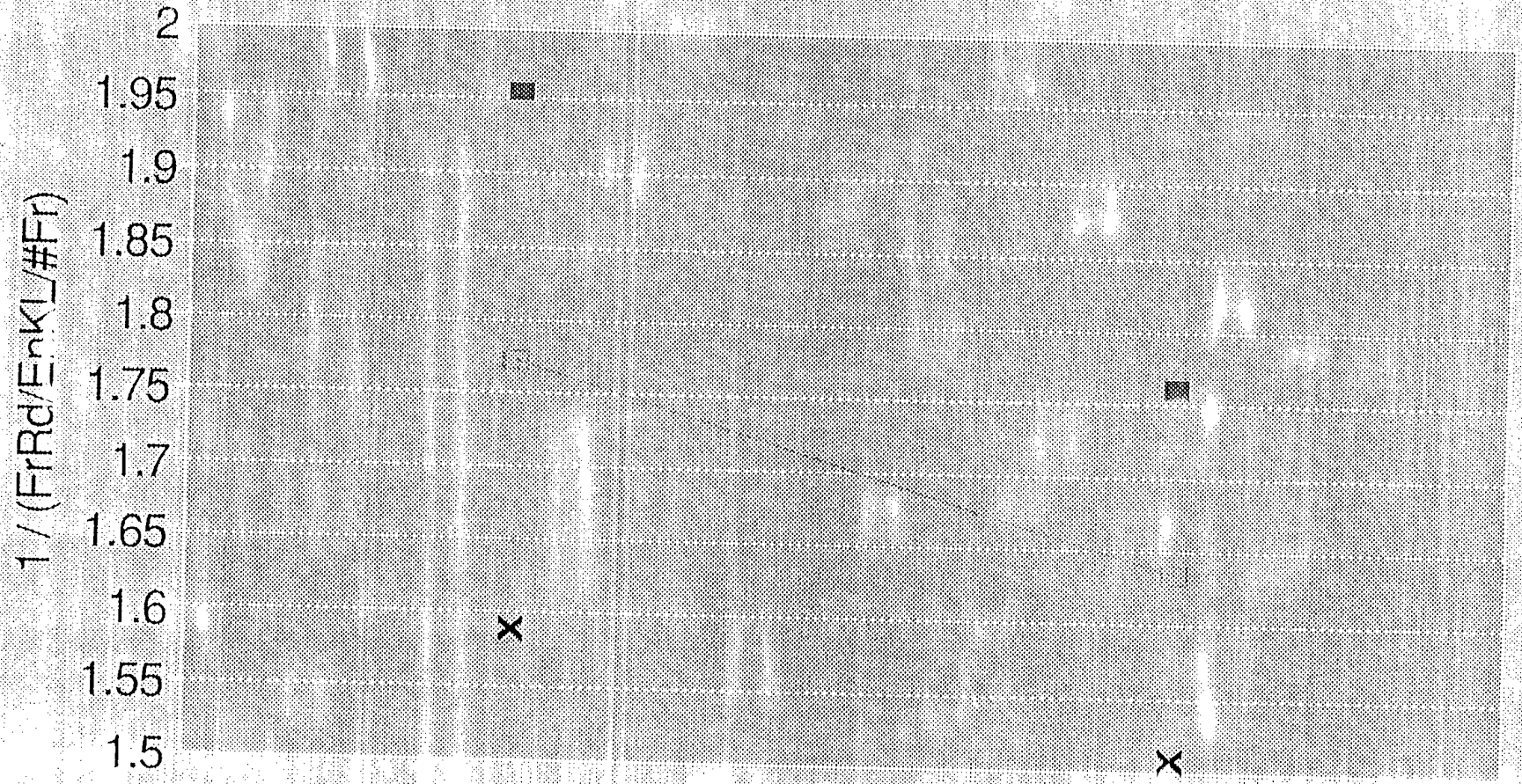
MOE #3 - 1 / (Friendly Rounds / Enemy Killed /

Weapon: DP 2 & 4 (Force Set High)



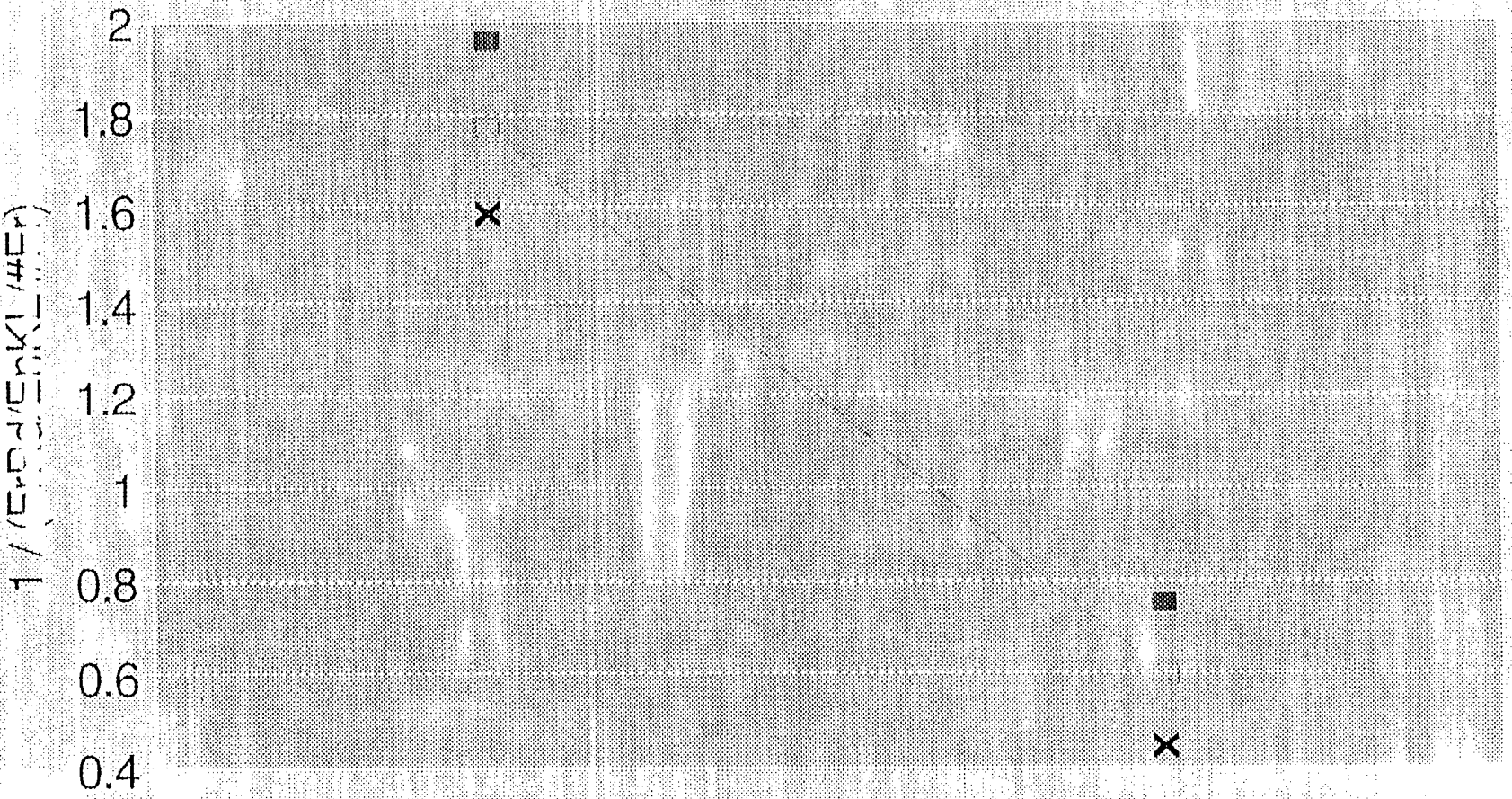
MOE #3 - 1 / (Friendly Rounds / Enemy Killed /

Weapon: DP 1 & 3 (Force Set Low)



MOE #3 - 1 / (Friendly Rounds / Enemy Killed /

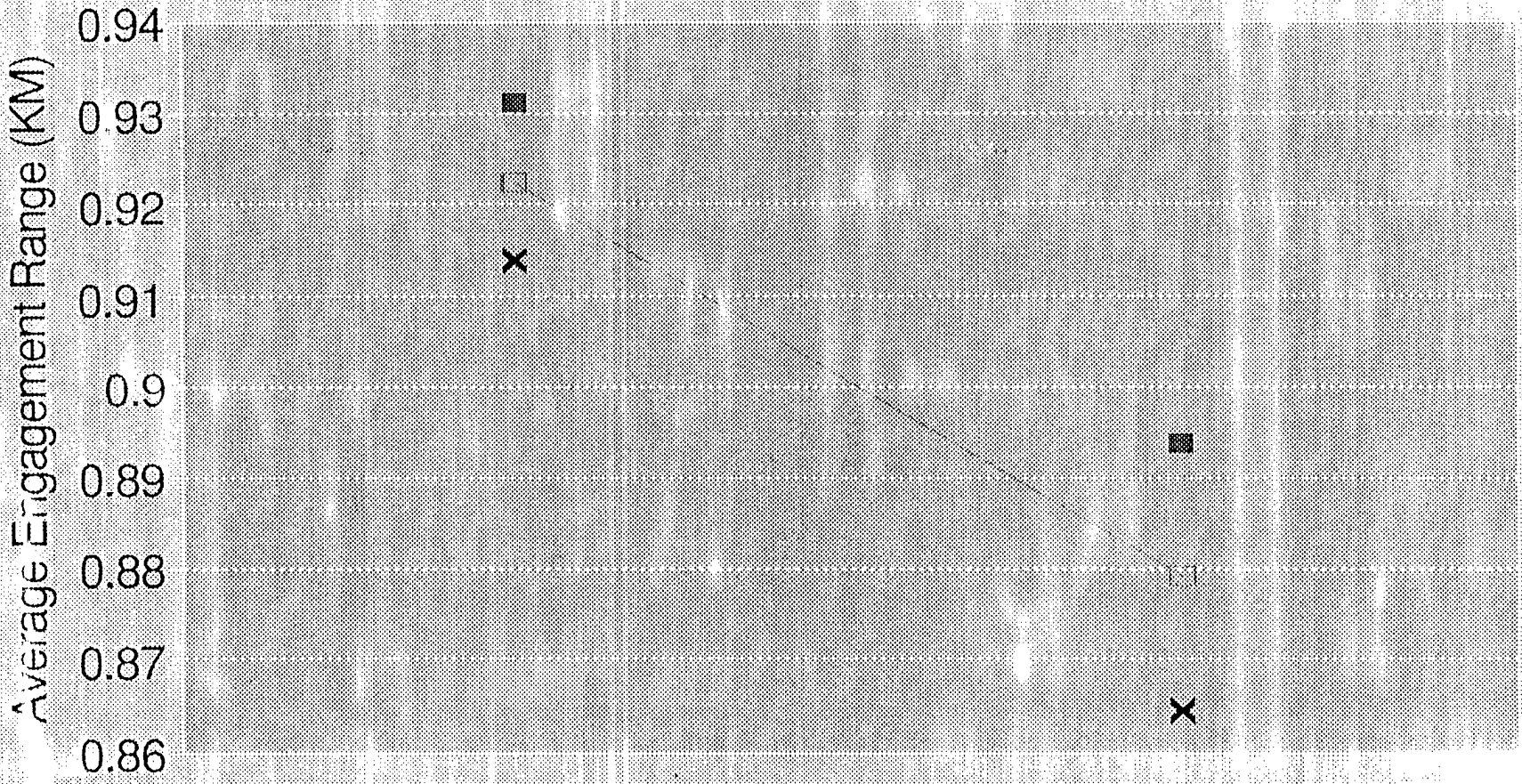
Force & Weapon: DP 1 & 4



Enclosure 7
MOE Analysis
for Average Engagement Range

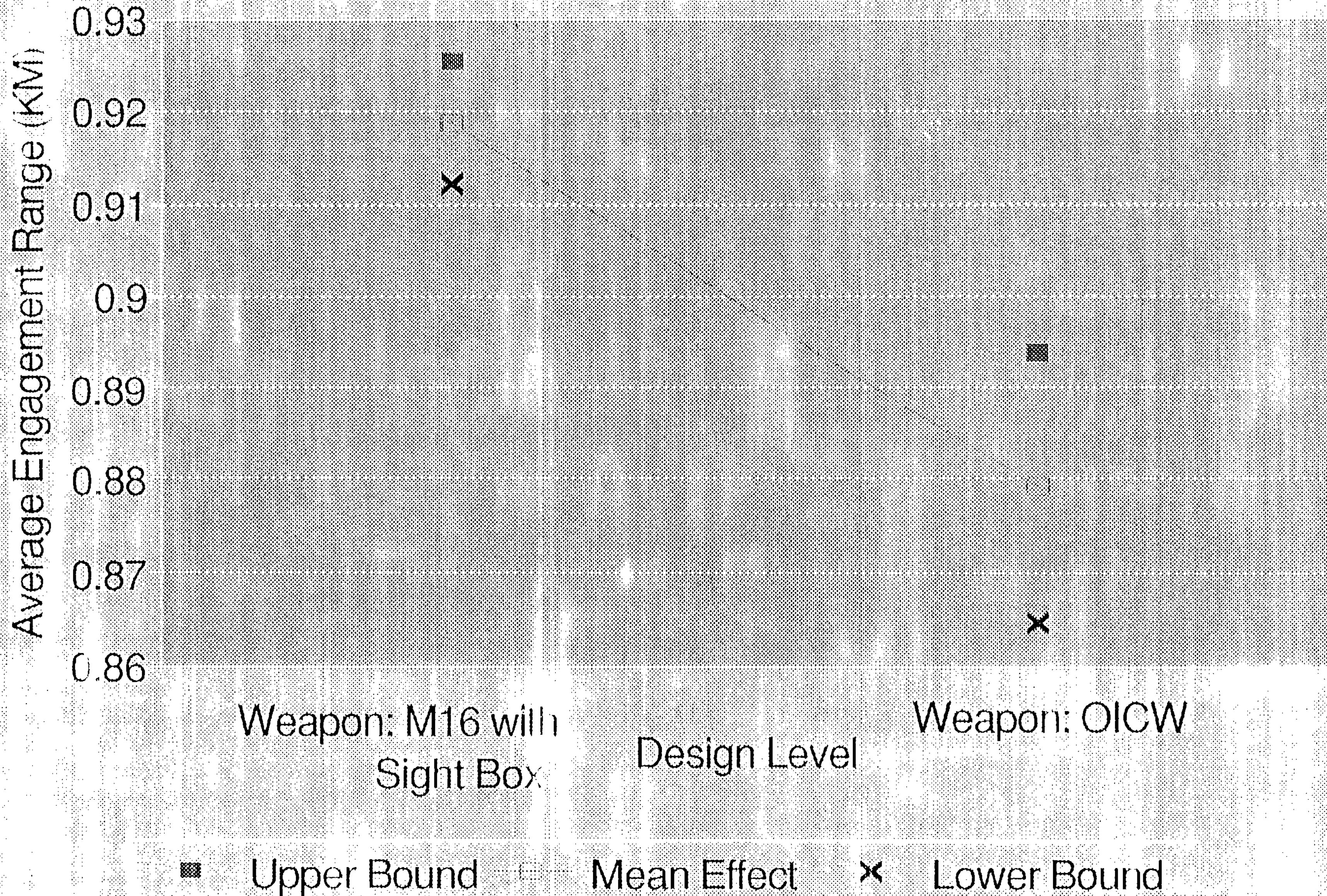
MOE #4 - Average Engagement Range

Force & Weapon: DP 1 & 4



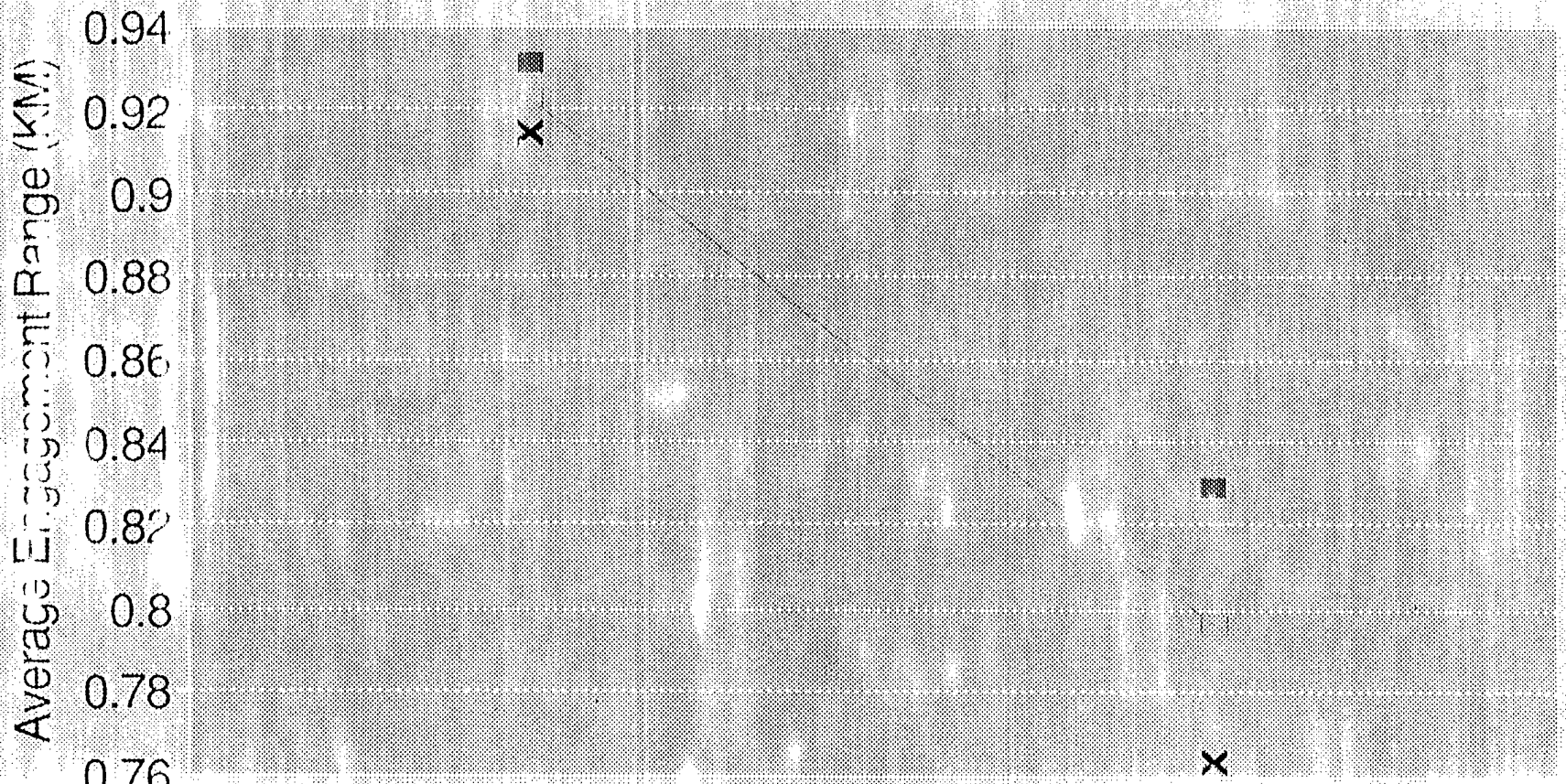
MOE #4 - Average Engagement Range

Weapon: DP 2 & 4 (Force Set High)



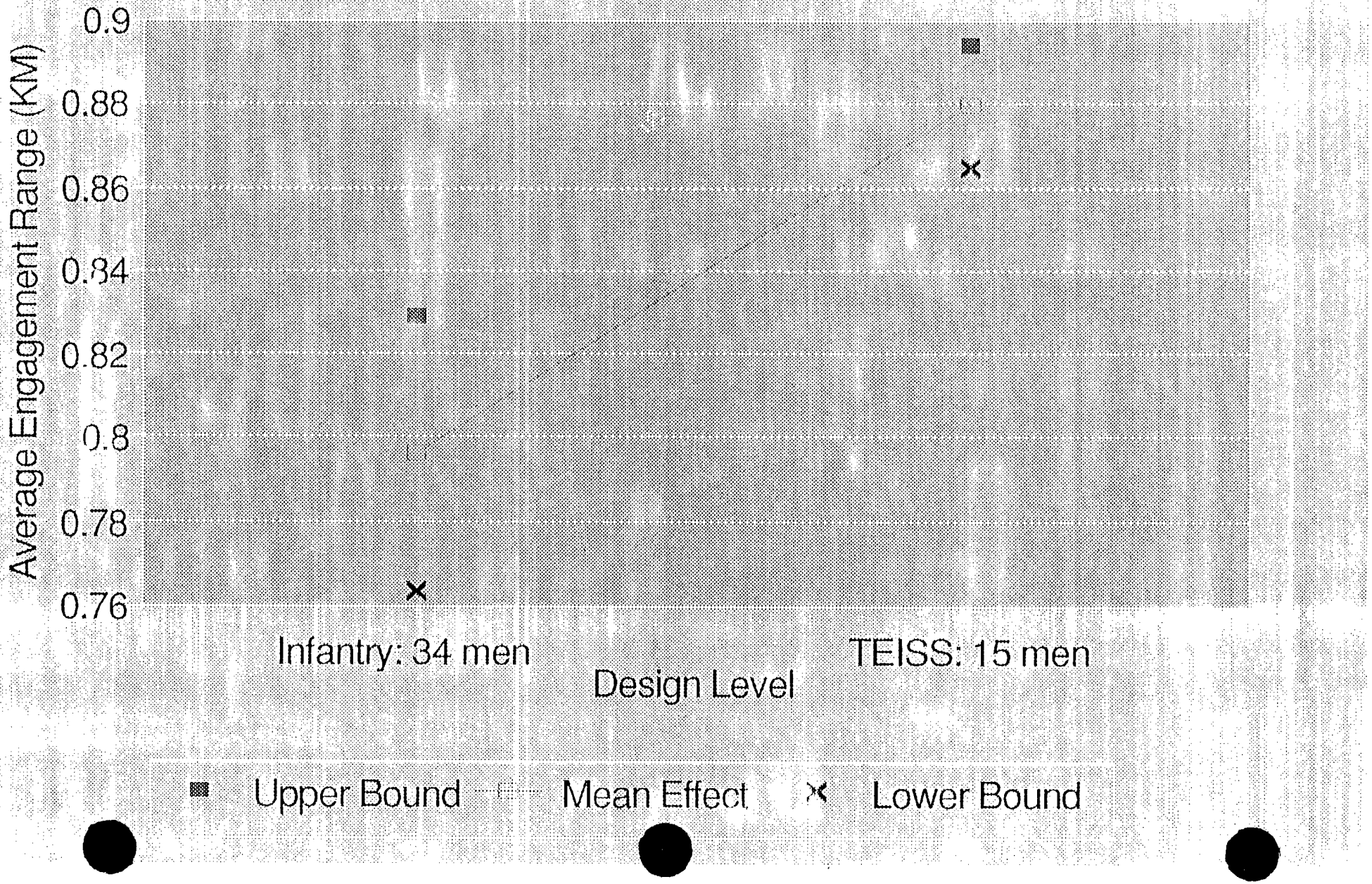
MOE #4 - Average Engagement Range

Weapon: DP 1 & 3 (Force Set Low)



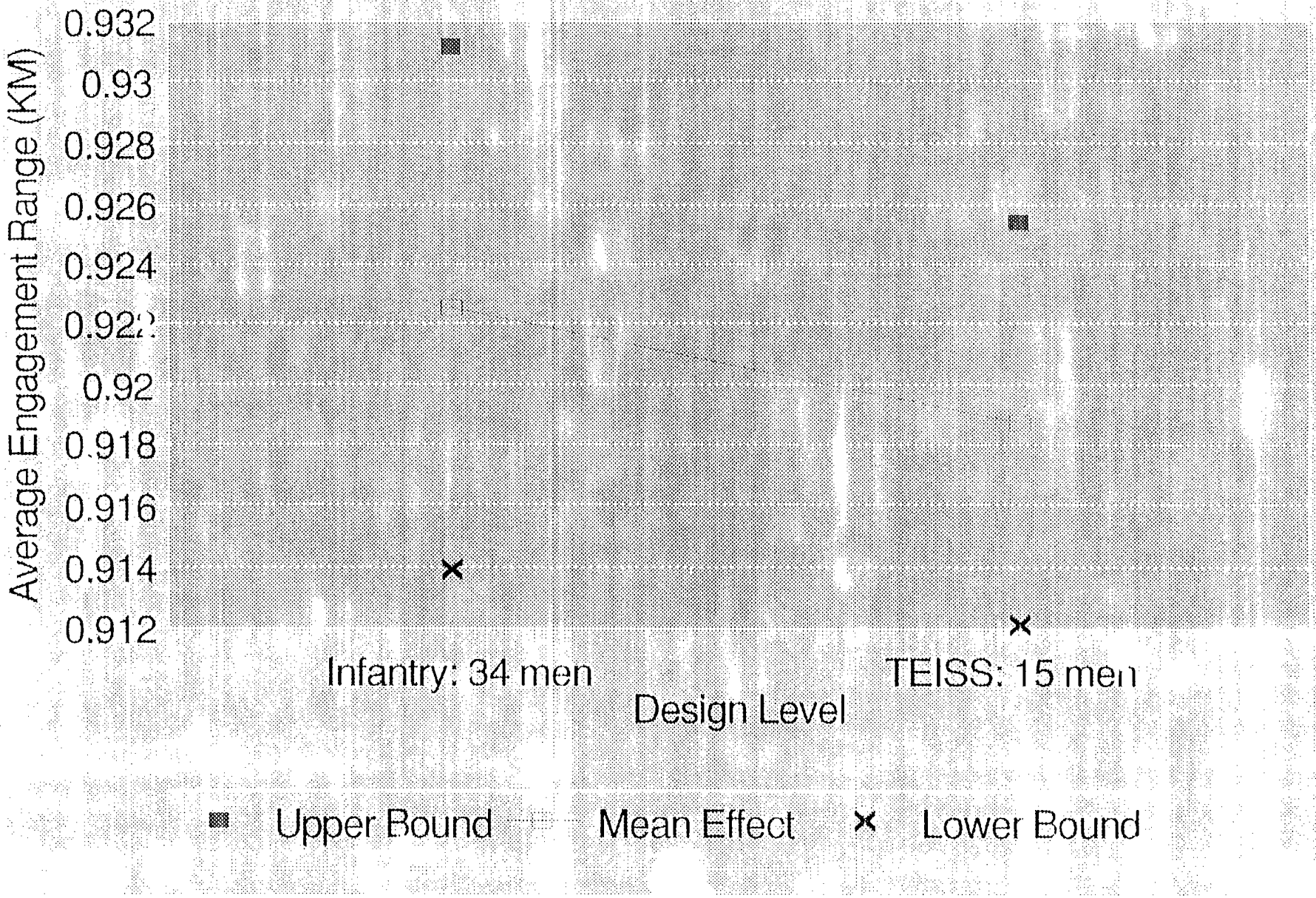
MOE #4 - Average Engagement Range

Force: DP 3 & 4 (Weapon Set High)



MOE #4 - Average Engagement Range

Force: DP 1 & 2 (Weapon Set Low)



MOE #4 - Average Engagement Range

Constants	
k =	2
p =	1
RanNum 1 =	1693
RanNum 2 =	89525
RanNum 3 =	11149
RanNum 4 =	93953
RanNum 5 =	29983
RanNum 6 =	34972
t =	1.478
n =	4

	Low Level	High Level
Factor 1: Force	Infantry: 34 men	TEISS: 17 men
Factor 2: Weapon	Weapon: M16 with Sight Box	Weapon: OICW

DP	Force	Weapon	RandNum1 1693 Run 1	RandNum2 89525 Run 2	RandNum3 11149 Run 3	RandNum4 93953 Run 4
1	-	-	0.912	0.913	0.924	0.941
2	+	-	0.908	0.917	0.933	0.917
3	-	+	0.806	0.722	0.818	0.839
4	+	+	0.845	0.893	0.889	0.89
Total Effects:	Force		0.0175	0.0875	0.04	0.0135
	Weapon		-0.0845	-0.1075	-0.075	-0.0645
	Force & Weapon		0.0215	0.0835	0.031	0.0375

Factor 1:	Force	*Factor 2:*	Weapon
Mean Effect:	0.039625	***Mean Effect:***	-0.08288
Variance:	0.001155	**Variance:**	0.000336
Half Length:	0.025112	**Half Length:**	0.013551
Upper Bound:	0.064737	***Upper Bound:***	-0.06932
Lower Bound:	0.014513	***Lower Bound:***	-0.09643
Significant	Yes	*Significant*	Yes

Force & Weapon	
Mean Effect:	0.043375
Variance:	0.000759
Half Length:	0.020356
Upper Bound:	0.063731
Lower Bound:	0.023019
Significant	Yes

Enclosure 8

MOE Analysis
for Number of Detections

MOE #5 - Number of Detections

Constants	
k =	2
p =	1
RanNum 1 =	1693
RanNum 2 =	89525
RanNum 3 =	11149
RanNum 4 =	93953
RanNum 5 =	29983
RanNum 6 =	34972
t =	1.478
n =	4

	Low Level	High Level
Factor 1: Force	Infantry: 34 men	TEISS: 17 men
Factor 2: Weapon	Weapon: M16 with Sight Box	Weapon: OICW

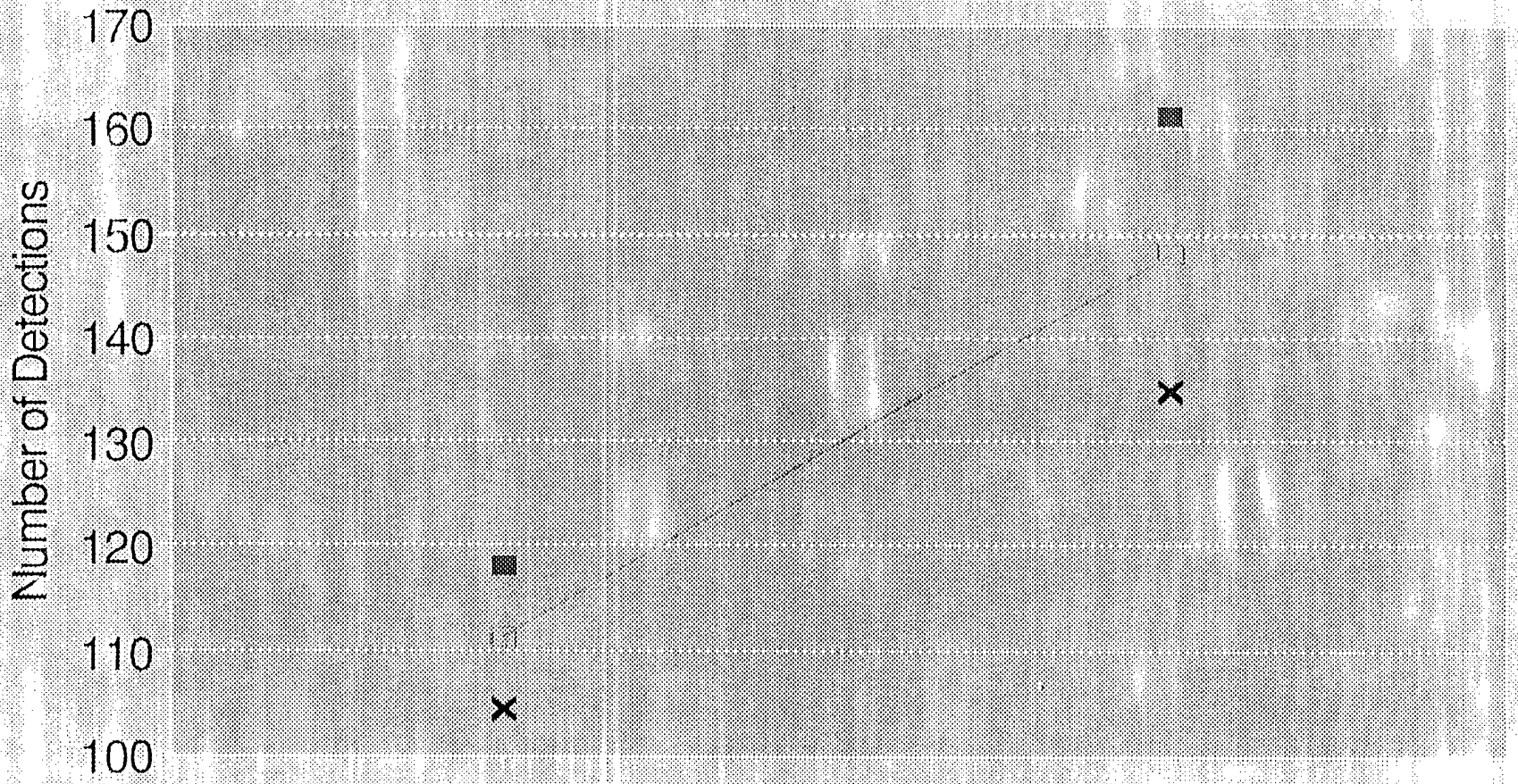
DP	Force	Weapon	RandNum1 1693 Run 1	RandNum2 89525 Run 2	RandNum3 11149 Run 3	RandNum4 93953 Run 4
1	-	-	349	370	369	362
2	+	-	103	101	120	121
3	-	+	369	374	370	381
4	+	+	175	125	145	147
Total Effects:	Force		-220	-259	-237	-237.5
	Weapon		46	14	13	22.5
	Force & Weapon		26	10	12	3.5

Factor 1:	Force	*Factor 2:*	Weapon
Mean Effect:	-238.375	*Mean Effect:*	23.875
Variance:	255.2292	Variance:	235.7292
Half Length:	11.80619	Half Length:	11.34622
Upper Bound:	-226.569	*Upper Bound:*	35.22122
Lower Bound:	-250.181	*Lower Bound:*	12.52878
Significant	Yes	*Significant*	Yes

Force & Weapon	
Mean Effect:	12.875
Variance:	89.72917
Half Length:	7.000213
Upper Bound:	19.87521
Lower Bound:	5.874787
Significant	Yes

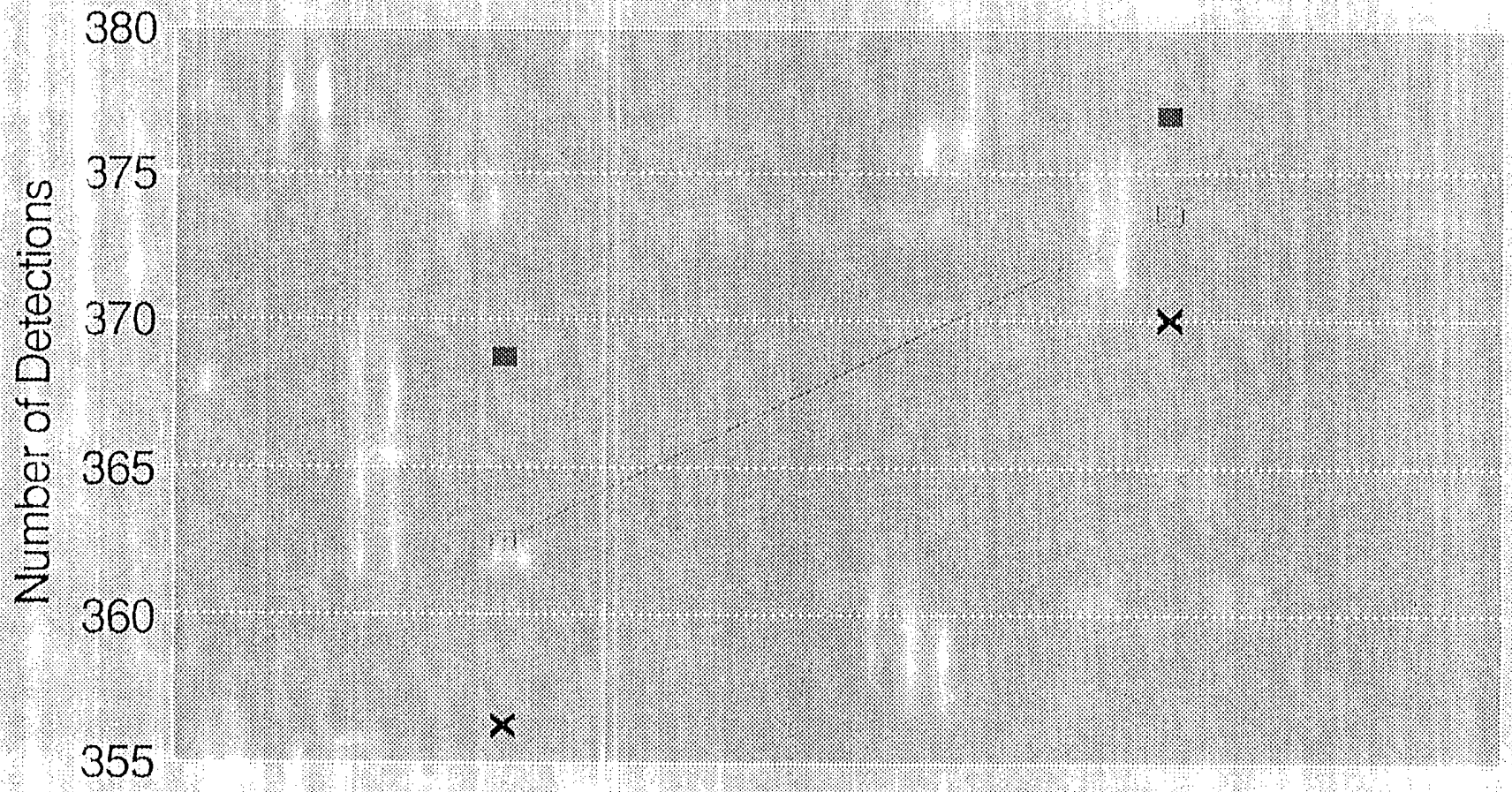
MOE #5 - Number of Detections

Weapon: DP 2 & 4 (Force Set High)



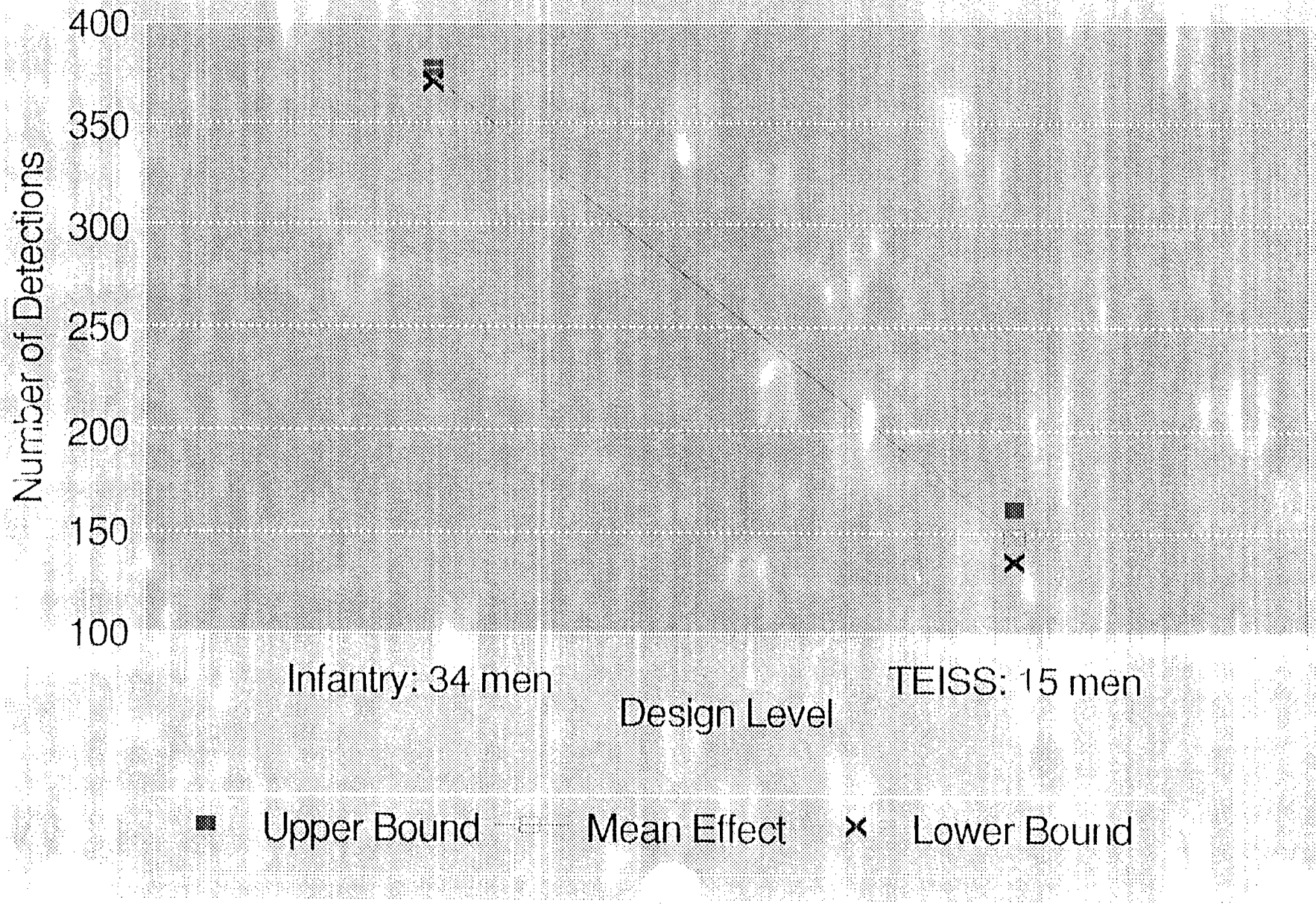
MOE #5 - Number of Detections

Weapon: DP 1 & 3 (Force Set Low)



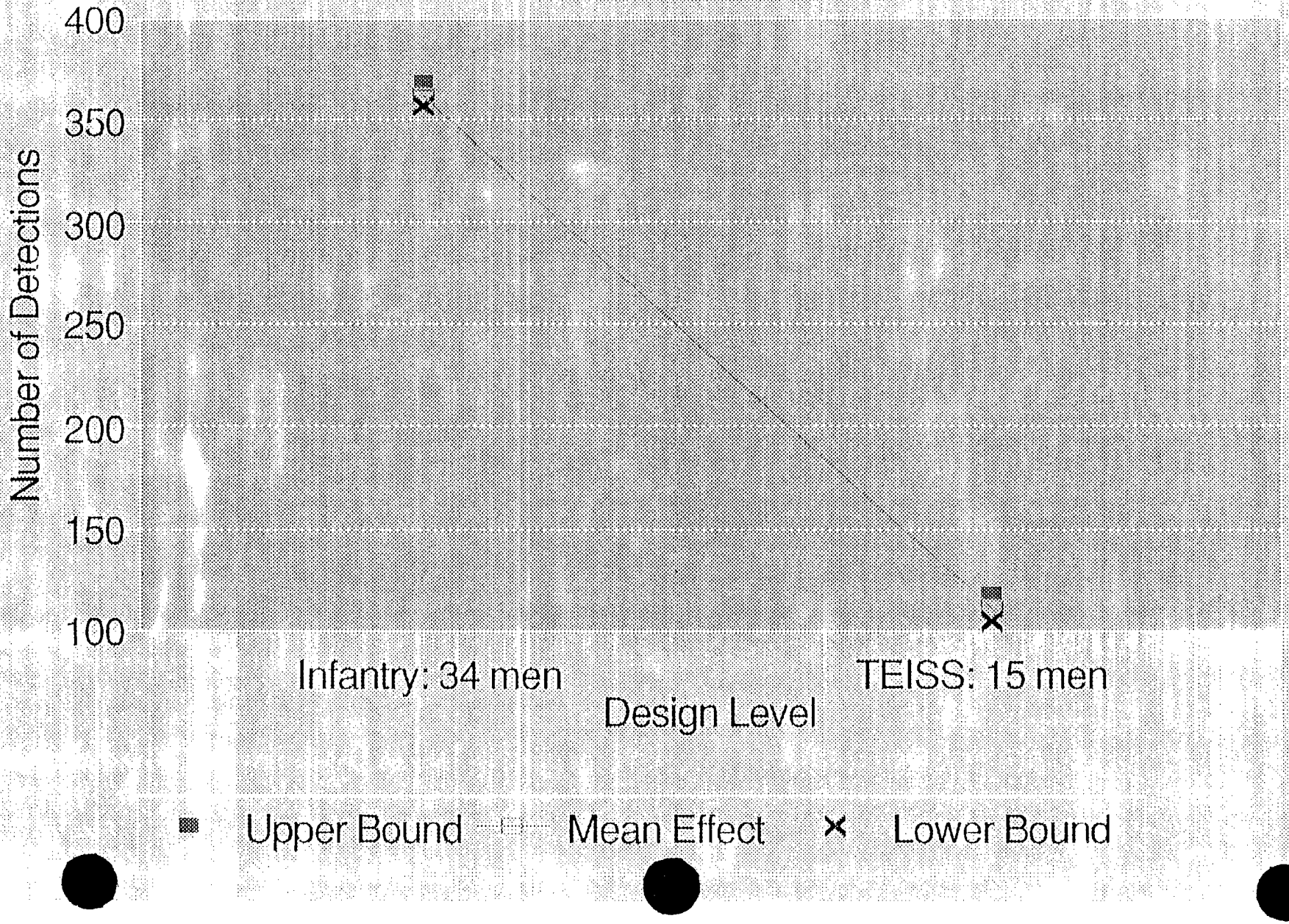
MOE #5 - Number of Detections

Force: DP 3 & 4 (Weapon Set High)



MOE #5 - Number of Detections

Force: DP 1 & 2 (Weapon Set Low)

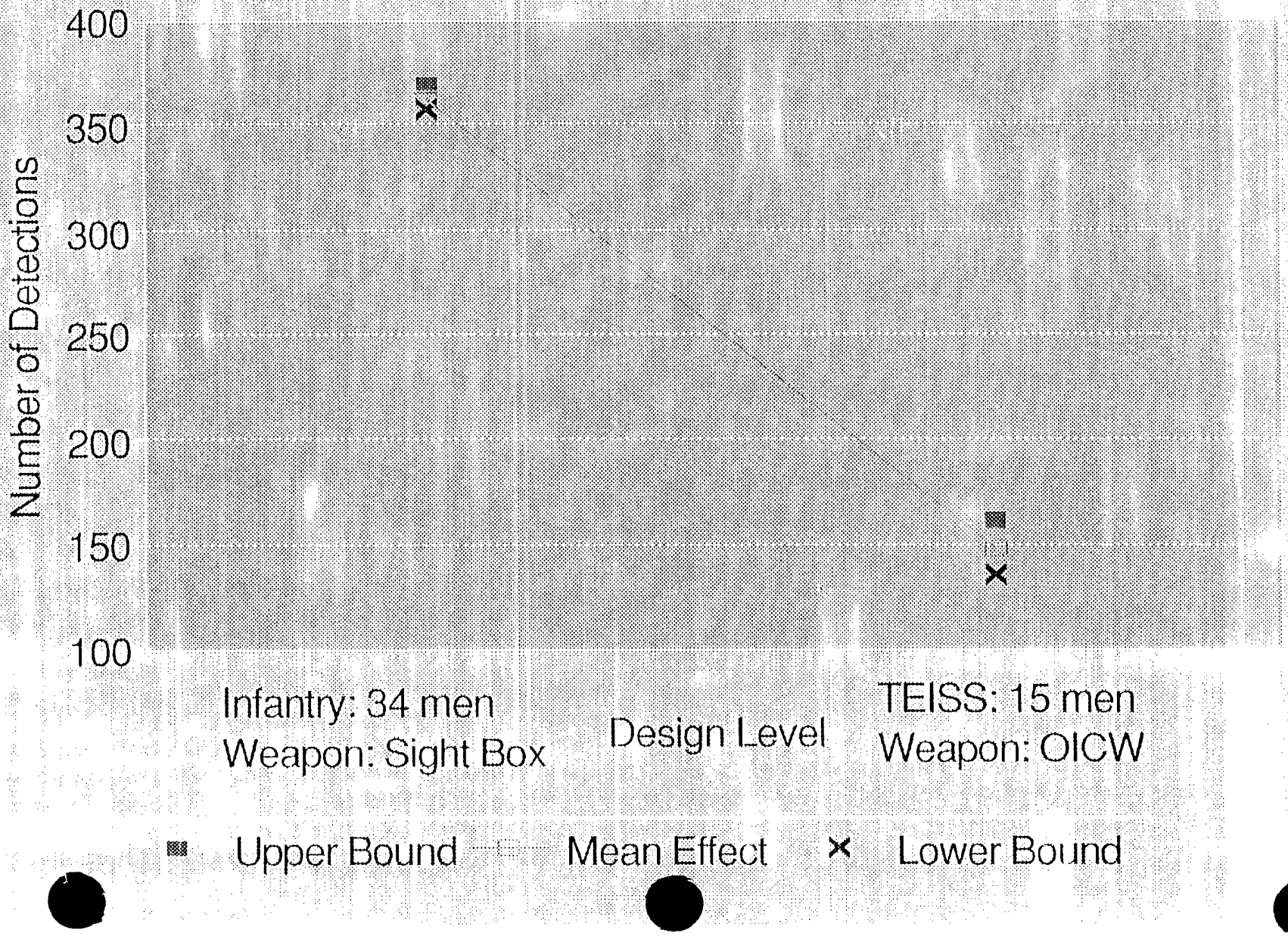


Enclosure 9

MOE Analysis
for Average Kill Range

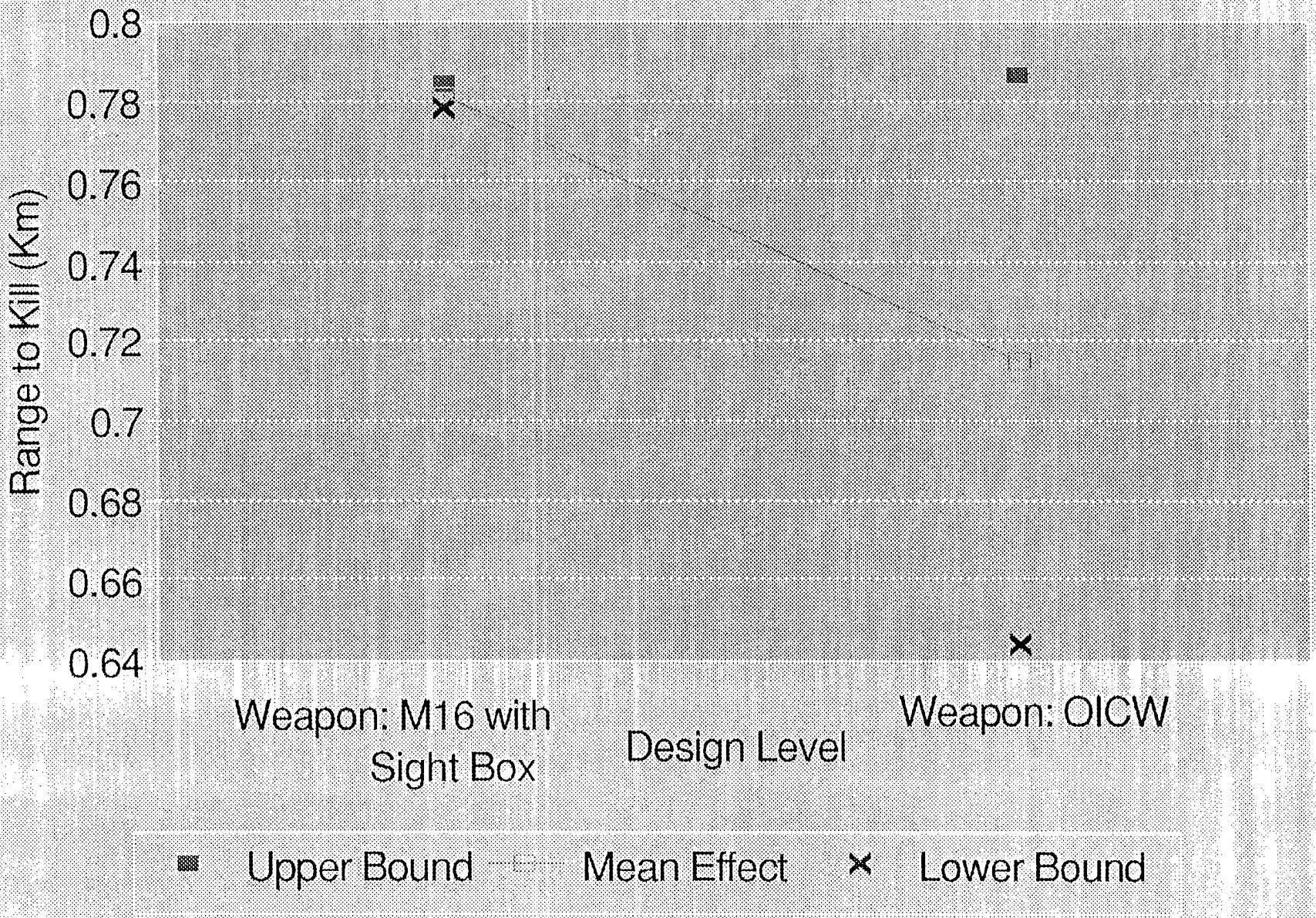
MOE #5 - Number of Detections

Force & Weapon: DP 1 & 4



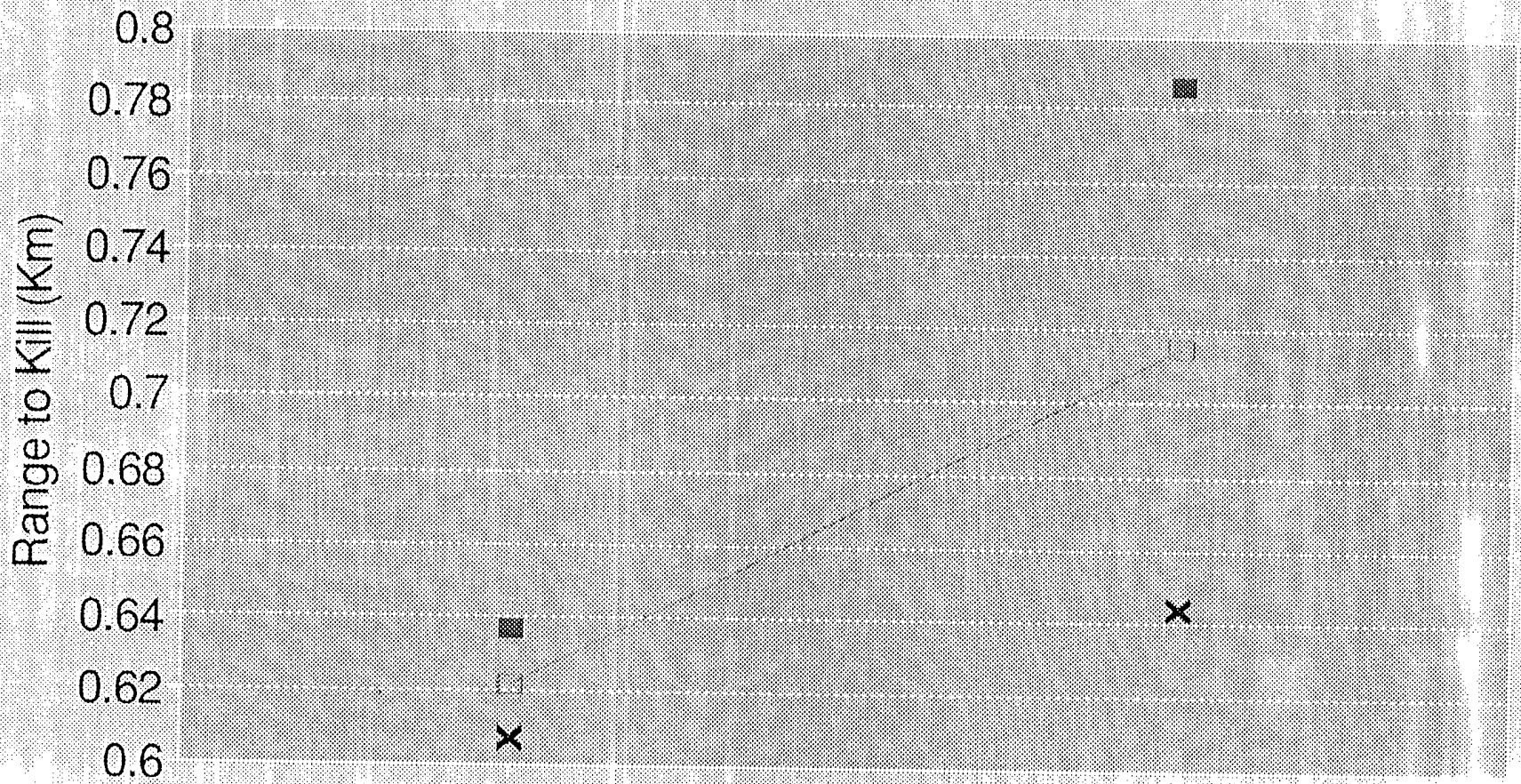
MOE #6 - Average Range to Kill

Weapon: DP 2 & 4 (Force Set High)



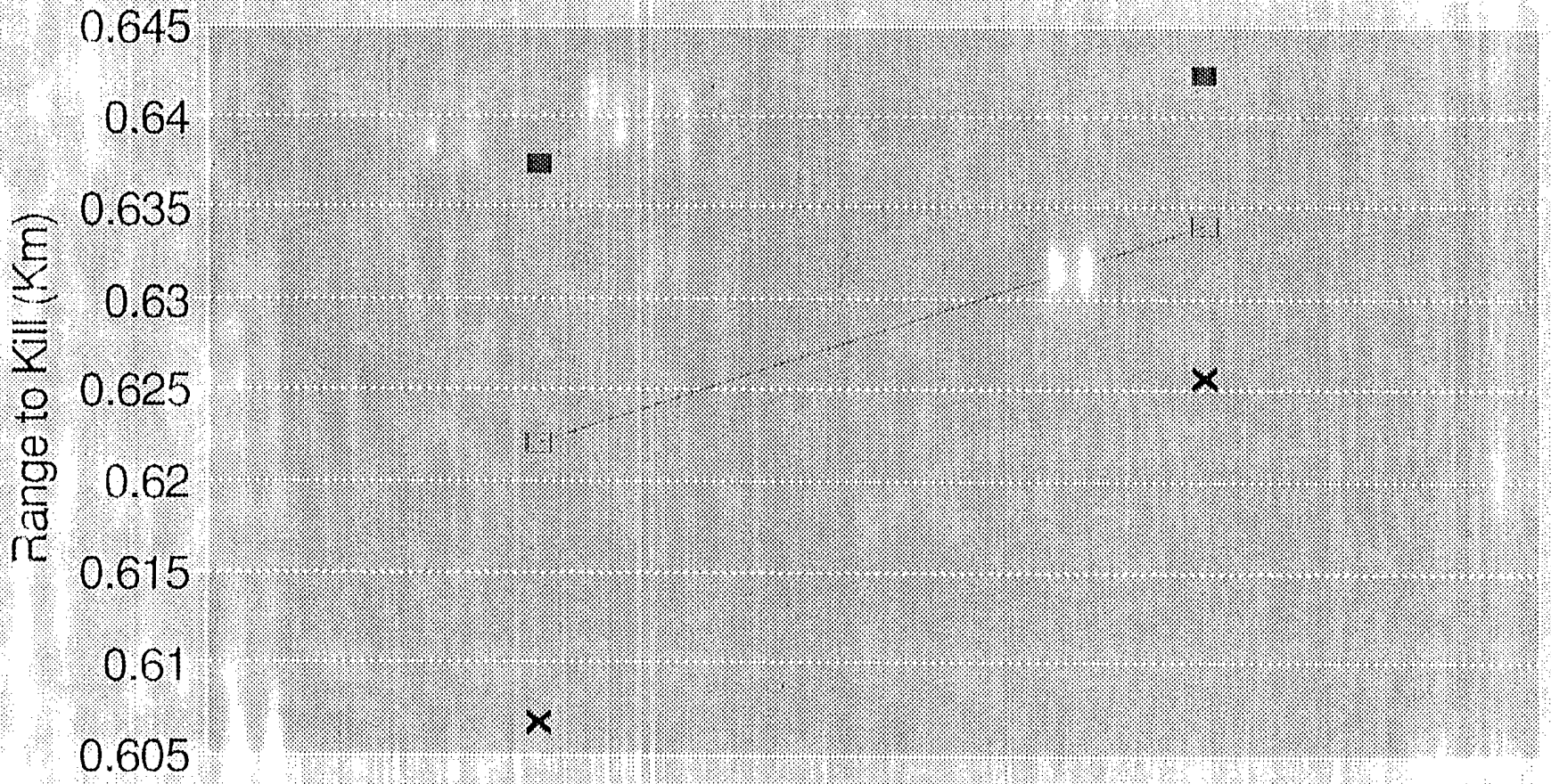
MOE #6 - Average Range to Kill

Force & Weapon: DP 1 & 4



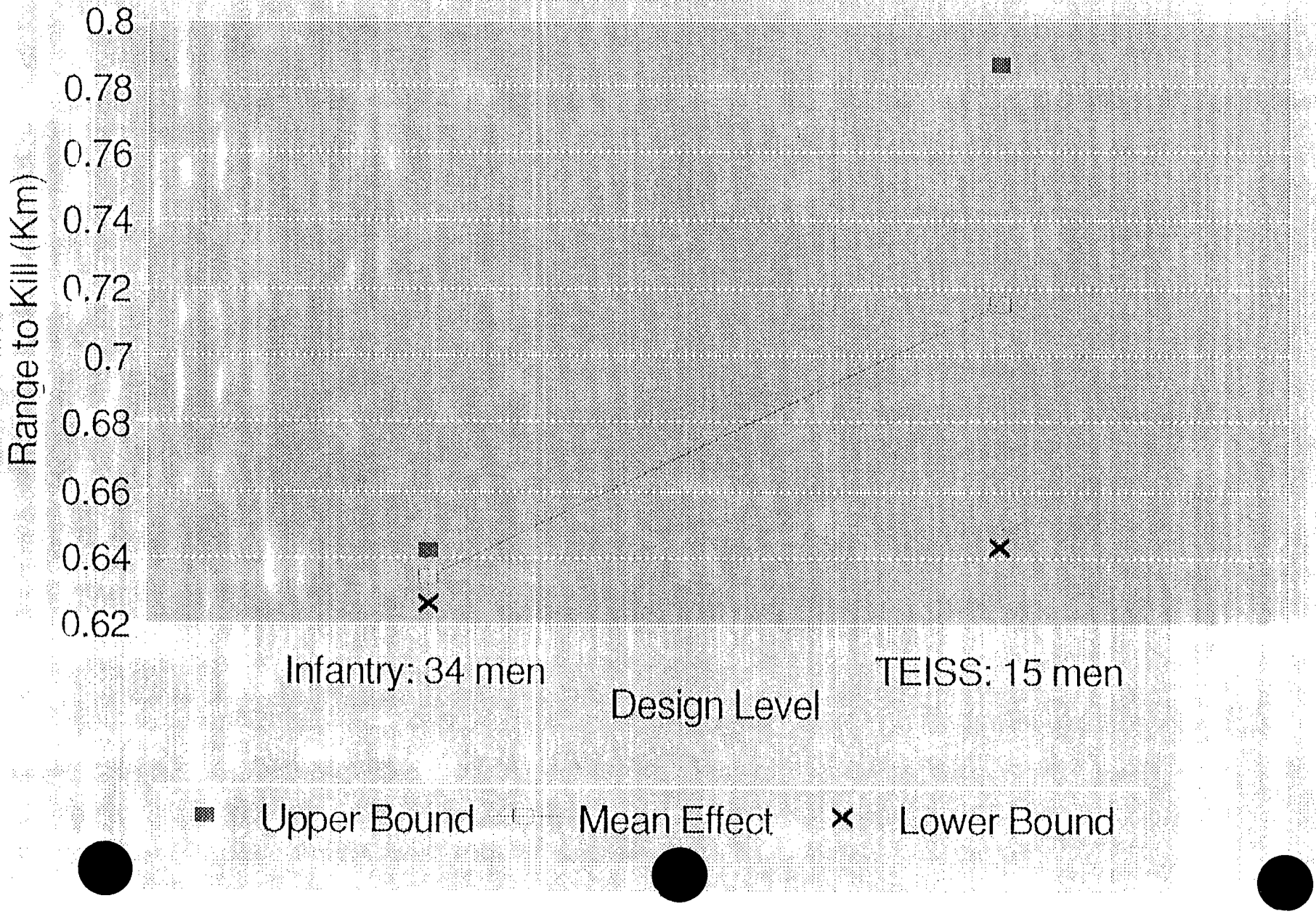
MOE #6 - Average Range to Kill

Weapon: DP 1 & 3 (Force Set Low)



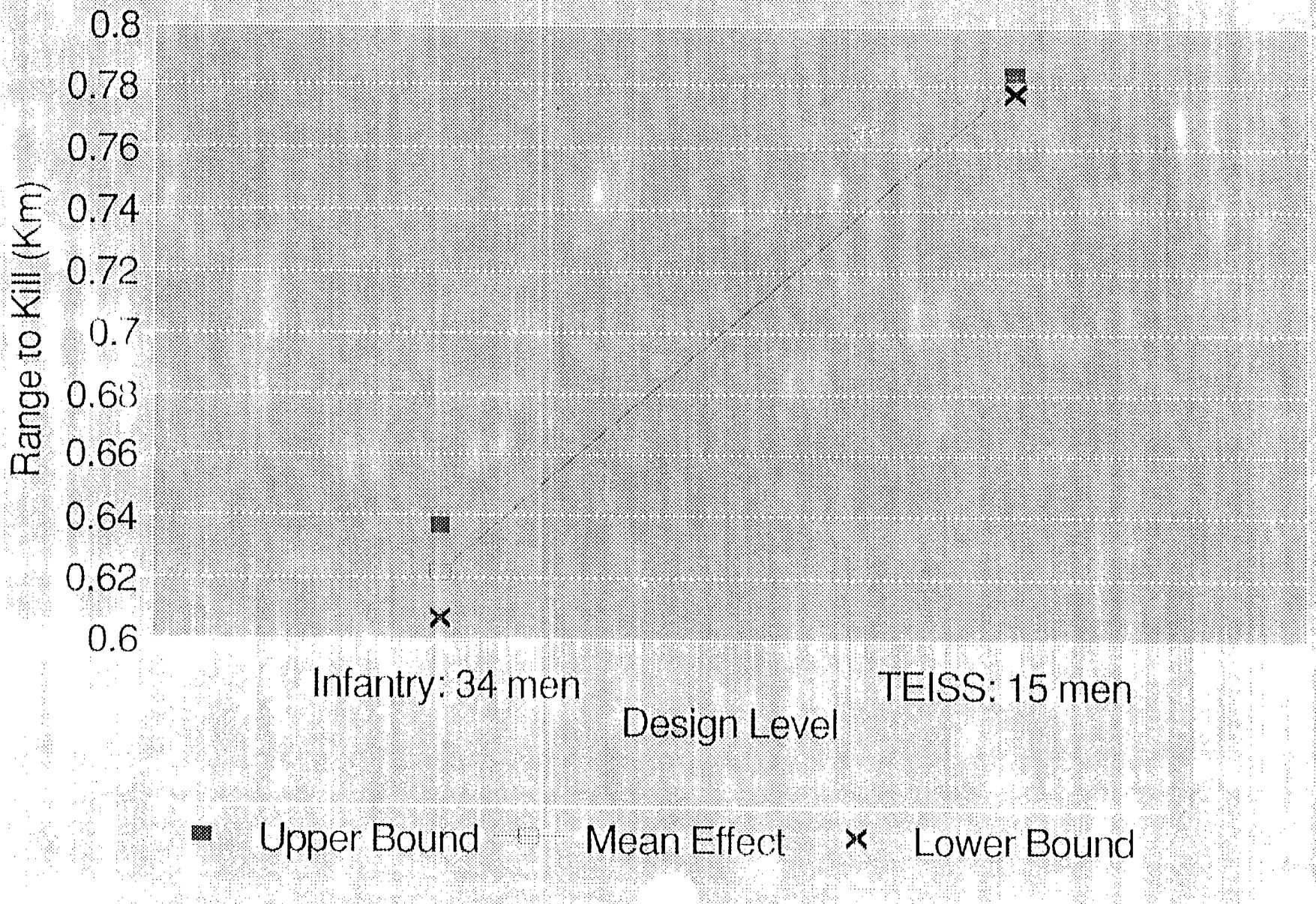
MOE #6 - Average Range to Kill

Force: DP 3 & 4 (Weapon Set High)



MOE #6 - Average Range to Kill

Force: DP 1 & 2 (Weapon Set Low)



MOE #6 - Average Range to Kill

Constants	
k =	2
p =	1
RanNum 1 =	1693
RanNum 2 =	89525
RanNum 3 =	11149
RanNum 4 =	93953
RanNum 5 =	29983
RanNum 6 =	34972
t =	1.478
n =	4

	Low Level	High Level
Factor 1: Force	Infantry: 34 men	TEISS: 17 men
Factor 2: Weapon	Weapon: M16 with Sight Box	Weapon: OICW

DP	Force	Weapon	RandNum1 1693 Run 1	RandNum2 89525 Run 2	RandNum3 11149 Run 3	RandNum4 93953 Run 4
1	-	-	0.623	0.63	0.646	0.589
2	+	-	0.787	0.783	0.777	0.777
3	-	+	0.628	0.652	0.634	0.622
4	+	+	0.548	0.773	0.768	0.771
Total Effects:	Force		0.042	0.137	0.1325	0.1685
	Weapon		-0.117	0.006	-0.0105	0.0135
	Force & Weapon		-0.122	-0.016	0.0015	-0.0195

Factor 1:	Force	*Factor 2:*	Weapon
Mean Effect:	0.12	***Mean Effect:***	-0.027
Variance:	0.002961	**Variance:**	0.003701
Half Length:	0.040209	**Half Length:**	0.044955
Upper Bound:	0.160209	*Upper Bound:*	0.017955
Lower Bound:	0.079791	*Lower Bound:*	-0.07195
Significant	Yes	*Significant*	No

Force & Weapon	
Mean Effect:	-0.039
Variance:	0.003146
Half Length:	0.041451
Upper Bound:	0.002451
Lower Bound:	-0.08045
Significant	No

"indf1: INDIRECT FIRE REPORT"
"SELECTED BLUE SYSTEMS"
"-VS-   ALL RED"
"RUN 31----- SCENARIO 490"
"=="
"AVERAGE OVER ALL RUNS SELECTED"
"=="
"   ROUNDS   MUNITION MUNITION"
"   SYSTEM MUNITION ROUNDS KILLS PER KILL   USAGE   CONTRIB ENDGT"
"--"
"   "77.12
"=="
"INDIVIDUAL RUN STATISTICS"
"=="
"RUN" 31"   "77.12
"--"
"RUN" 32"   "77.12
"--"
"RUN" 33"   "77.12
"--"
"RUN" 34"   "77.13
"==

"kperse1: KILLS PER SYSTEM EMPLOYED"
"RUN 490---- SCENARIO 490"

"BLUE SYSTEMS		KILLS BY	NUMBER EMPLOYED	KILLS PER SYSTEM EMPLOYED"
"ALL BLUE	RUN" [illegible]	[illegible]	[illegible]	[illegible]
"	RUN" [illegible]	24	36	[illegible]
"	RUN" 33	24	36	0.67
"	RUN" 34	23	36	0.64
"	AVERAGE"	23.50	36	0.65

"RED SYSTEMS		KILLS BY	NUMBER EMPLOYED	KILLS PER SYSTEM EMPLOYED"
"ALL RED	RUN" 31	1	28	0.04
"	RUN" 32	2	28	0.07
"	RUN" 33	0	28	0.00
"	RUN" 34	0	28	0.00
"	AVERAGE"	0.75	28	0.03

"END GT(MIN)	RUN" 31	77.12
"	RUN" 32	77.12
"	RUN" 33	77.12
"	RUN" 34	77.13
"	AVERAGE"	77.12

"range1: DETECT/FIRE/KILL RANGE HISTOGRAM"
" ALL BLUE"
"-VS- ALL RED"

"RANGE(KM)in: RUN 31----- Scenario 490 Run:"	0.00	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88	0.99	31RUN 32----- Scenario 490 Run 1
"AVERAGE"											
"DETECTS"	0.2	0.5	0.5	0.8	2.5	8.0	6.2	20.0	37.5	3	
"FIRES"	0.0	0.0	0.0	14.5	56.0	65.5	52.5	76.0	197.0	3	
"KILLS"	0.0	0.0	0.0	2.2	7.5	4.8	4.2	1.8	1.2		

"ser2: SYSTEM EXCHANGE RATIO"
"RUN 490---- SCENARIO 490"

"BLUE SYSTEMS		KILLS BY	KILLS OF	SER"
"ALL BLUE	RUN" 31	23	1	23.00
"	RUN" 32	24	2	12.00
"	RUN" 33	24	0	"undef"
"	RUN" 34	23	0	"undef"
"	AVERAGE"	23.50	0.75	31.33

"RED SYSTEMS		KILLS BY	KILLS OF	SER"
"ALL RED	RUN" 31	1	23	0.04
"	RUN" 32	2	24	0.08
"	RUN" 33	0	24	0.00
"	RUN" 34	0	23	0.00
"	AVERAGE"	0.75	23.50	0.03

"END GT(MIN)	RUN" 31	77.12
"	RUN" 32	77.12
"	RUN" 33	77.12
"	RUN" 34	77.13
"	AVERAGE"	77.12

"time1: DETECT/FIRE/KILL TIME HISTOGRAM"
" ALL BLUE"
"-VS- ALL RED"

"TIME(MIN)in: RUN 31----- Scenario 490 Run:"	0.00	9.00	18.00	27.00	36.00	45.00	31RUN 32----- Scenario 490 Run: 54.00	63.00	72.00	81.00	90
"AVERAGE"											
"DETECTS"	1.8	0.0	0.0	0.0	50.8	39.0	116.0	78.5	87.5		
"FIRES"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	493.5		
"KILLS"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.5		

"time rng1: TIME VS RANGE VS DFK"
" ALL BLUE"
"-VS-   ALL RED"
"RUN 31----- Scenario 490 Run:" 31"RUN 32----- Scenario 490 Run:" 32"RUN 33

TIME (MIN)	DETECTIONS MEAN RANGE	DETECTIONS AVERAGE DETECTS	DF & IF FIRES MEAN DF RANGE	DF & IF FIRES AVG # DIRECT	DF & IF FIRES AVG # INDIR	DF & IF KILLS MEAN DF RANGE	DF & IF KILLS AVG # DIRECT	DF & IF KILLS MEAN IF RANGE	AV IN
0.00	0.41	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0
9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
18.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
27.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
36.00	2.17	50.75	0.00	0.00	0.00	0.00	0.00	0.00	0
45.00	1.96	39.00	0.00	0.00	0.00	0.00	0.00	0.00	0
54.00	1.70	116.00	0.00	0.00	0.00	0.00	0.00	0.00	0
63.00	1.11	78.50	0.00	0.00	0.00	0.00	0.00	0.00	0
72.00	0.99	87.50	0.80	493.50	0.00	0.63	23.50	0.00	0
81.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
90.00									

"csu1: COMBAT SYSTEM UTILIZATION"
"RUN 24----- SCENARIO 491"

"BLUE SYSTEMS		PERCENT CONTRIB	INITIAL STRENGTHS" INDIV SYS	SEL GROUP	PERCENT OF" GROUP	CSU"
"TEISSL	RUN" 21	33.33	2	19	10.53	3.17
"	RUN" 22	28.57	2	19	10.53	2.71
"	RUN" 23	25.00	2	19	10.53	2.38
"	RUN" 24	20.00	2	19	10.53	1.90
"	AVERAGE"	25.81	2	19	10.53	2.54
"TEISSS	RUN" 21	16.67	8	19	42.10	0.40
"	RUN" 22	42.86	8	19	42.10	1.02
"	RUN" 23	62.50	8	19	42.10	1.48
"	RUN" 24	60.00	8	19	42.10	1.42
"	AVERAGE"	48.39	8	19	42.10	1.08
"Teiss2	RUN" 21	50.00	7	19	36.84	1.36
"	RUN" 22	28.57	7	19	36.84	0.78
"	RUN" 23	12.50	7	19	36.84	0.34
"	RUN" 24	20.00	7	19	36.84	0.54
"	AVERAGE"	25.81	7	19	36.84	0.75
"UH-60	RUN" 21	0.00	2	19	10.53	0.00
"	RUN" 22	0.00	2	19	10.53	0.00
"	RUN" 23	0.00	2	19	10.53	0.00
"	RUN" 24	0.00	2	19	10.53	0.00
"	AVERAGE"	0.00	2	19	10.53	0.00

"RED SYSTEMS		PERCENT CONTRIB	INITIAL STRENGTHS" INDIV SYS	SEL GROUP	PERCENT OF" GROUP	CSU"
"CMDR	RUN" 21	"undef"	2	28	7.14	"undef"
"	RUN" 22	"undef"	2	28	7.14	"undef"
"	RUN" 23	0.00	2	28	7.14	0.00
"	RUN" 24	0.00	2	28	7.14	0.00
"	AVERAGE"	0.00	2	28	7.14	0.00
"LT	RUN" 21	"undef"	8	28	28.57	"undef"
"	RUN" 22	"undef"	8	28	28.57	"undef"
"	RUN" 23	0.00	8	28	28.57	0.00
"	RUN" 24	0.00	8	28	28.57	0.00
"	AVERAGE"	0.00	8	28	28.57	0.00
"LT MG	RUN" 21	"undef"	0	28	0.00	"undef"
"	RUN" 22	"undef"	0	28	0.00	"undef"
"	RUN" 23	0.00	0	28	0.00	"undef"
"	RUN" 24	0.00	0	28	0.00	"undef"
"	AVERAGE"	0.00	0	28	0.00	0.00
"RIFLEM	RUN" 21	"undef"	11	28	39.28	"undef"
"	RUN" 22	"undef"	11	28	39.28	"undef"
"	RUN" 23	100.00	11	28	39.28	2.54
"	RUN" 24	0.00	11	28	39.28	0.00
"	AVERAGE"	50.00	11	28	39.28	0.64
"SVD	RUN" 21	"undef"	4	28	14.28	"undef"
"	RUN" 22	"undef"	4	28	14.28	"undef"
"	RUN" 23	0.00	4	28	14.28	0.00
"	RUN" 24	100.00	4	28	14.28	7.00
"	AVERAGE"	50.00	4	28	14.28	1.75
"Trk	RUN" 21	"undef"	2	28	7.14	"undef"
"	RUN" 22	"undef"	2	28	7.14	"undef"

"	RUN" 23	0.00	2	28	7.14	0.00
"	RUN" 24	0.00	2	28	7.14	0.00
"	AVERAGE"	0.00	2	28	7.14	0.00
"----------	----------	----------	----------	----------	----------	----------
"Trk Ut	RUN" 21	"undef"	0	28	0.00	"undef"
"	RUN" 22	"undef"	0	28	0.00	"undef
"	RUN" 23	0.00	0	28	0.00	"undef
"	RUN" 24	0.00	0	28	0.00	"undef"
"	AVERAGE"	0.00	0	28	0.00	0.00
"----------	----------	----------	----------	----------	----------	----------
"ZODIAC	RUN" 21	"undef"	1	28	3.57	"undef"
"	RUN" 22	"undef"	1	28	3.57	"undef"
"	RUN" 23	0.00	1	28	3.57	0.00
"	RUN" 24	0.00	1	28	3.57	0.00
"	AVERAGE"	0.00	1	28	3.57	0.00
"==========	==========	==========	==========	==========	==========	==========

"detect1: DETECTION RATIO"
" ALL BLUE"
"-VS-   ALL RED"
"RUN 21----- SCENARIO 490"

"RUN	BLUE DETECTS RED	RED DETECTS BLUE	DETECTION" RATIO	END GT"
21	103	83	1.24	60.32
22	101	86	1.17	60.30
23	120	78	1.54	60.32
24	121	72	1.68	60.17
"AVG"	111.25	79.75	1.39	60.27

"dfkch1: DETECT/FIRE/KILL TOTALS CHART"
" ALL BLUE"
"-VS- ALL RED"
"RUN 21----- Scenario 490 RUN"

	21	22	23	24
"TOTAL"				
"DETECTS"	103.00	101.00	120.00	121.00
"FIRES"	1458.00	1449.00	1457.00	1361.00
"KILLS"	6	7	8	10

"dfktal: DETECT/FIRE/KILL AVERAGES"
" ALL BLUE"
"-VS- ALL RED"
"RUN 21----- SCENARIO 490"

	DETECTS	FIRINGS		KILLS			AVERAGE RANGES				
							DETECT	FIRINGS	KILLS		
RUN		DF	IF	DF	IF	MINE		DF only	DF	IF	EN
21	103	1456	0	6	0	0	1.520	0.908	0.787	0.000	6
22	101	1447	2	7	0	0	1.545	0.917	0.783	0.000	6
23	120	1455	2	8	0	0	1.494	0.933	0.777	0.000	6
24	121	1359	2	10	0	0	1.431	0.917	0.777	0.000	6
TOT	445	5717	6	31	0	0					
AVG	111.2	1429.2	1.5	7.8	0.0	0.0	1.494	0.919	0.780	0.000	6
SDV	10.7	47.0	1.0	1.7	0.0	0.0	0.049	0.011	0.005	0.000	
"95% CONFIDENCE INTERVALS (NORMAL DISTRIBUTION)"											
LOW	90.2	1337.1	0.0	4.4	0.0	0.0	1.398	0.898	0.771	0.000	6
UPP	132.3	1521.4	3.4	11.1	0.0	0.0	1.591	0.940	0.789	0.000	6

"fer1: FORCE EXCHANGE RATIO"
" ALL BLUE"
"-VS- ALL RED"
"RUN 21----- SCENARIO 490"

"RUN	" RED LOSSES	BLUE" LOSSES	LER	INIT RED	INIT BLUE	IFR	FER	EN
21	6	0	0.00	28	19	1.47	0.00	60.32
22	7	0	0.00	28	19	1.47	0.00	60.30
23	8	1	8.00	28	19	1.47	5.43	60.32
24	10	1	10.00	28	19	1.47	6.78	60.17
"AVG"	7.75	0.50	15.50	28	19	1.47	10.52	60.27

Enclosure 10

MOE Analysis
for Percent Contribution

"percon1: PERCENT CONTRIBUTION"
"RUN 44----- SCENARIO 490"

"BLUE SYSTEMS		KILLS BY INDIV SYS	KILLS BY SEL GROUP	PERCENT" CONTRIBUTION"
"TEISSL	RUN" 41	1	22	4.54
"	RUN" 42	1	11	9.09
"	RUN" 43	3	11	27.27
"	RUN" 44	1	10	10.00
"	AVERAGE"	1.50	13.50	11.11
"TEISSS	RUN" 41	11	22	50.00
"	RUN" 42	2	11	18.18
"	RUN" 43	3	11	27.27
"	RUN" 44	4	10	40.00
"	AVERAGE"	5.00	13.50	37.04
"Teiss2	RUN" 41	10	22	45.45
"	RUN" 42	8	11	72.73
"	RUN" 43	5	11	45.45
"	RUN" 44	5	10	50.00
"	AVERAGE"	7.00	13.50	51.85
"UH-60	RUN" 41	0	22	0.00
"	RUN" 42	0	11	0.00
"	RUN" 43	0	11	0.00
"	RUN" 44	0	10	0.00
"	AVERAGE"	0.00	13.50	0.00

"RED SYSTEMS		KILLS BY INDIV SYS	KILLS BY SEL GROUP	PERCENT" CONTRIBUTION"
"CMDR	RUN" 41	0	1	0.00
"	RUN" 42	0	0	"undef"
"	RUN" 43	0	1	0.00
"	RUN" 44	0	1	0.00
"	AVERAGE"	0.00	0.75	0.00
"LT	RUN" 41	0	1	0.00
"	RUN" 42	0	0	"undef"
"	RUN" 43	0	1	0.00
"	RUN" 44	0	1	0.00
"	AVERAGE"	0.00	0.75	0.00
"LT MG	RUN" 41	0	1	0.00
"	RUN" 42	0	0	"undef"
"	RUN" 43	0	1	0.00
"	RUN" 44	0	1	0.00
"	AVERAGE"	0.00	0.75	0.00
"RIFLEM	RUN" 41	1	1	100.00
"	RUN" 42	0	0	"undef"
"	RUN" 43	1	1	100.00
"	RUN" 44	0	1	0.00
"	AVERAGE"	0.50	0.75	66.67
"SVD	RUN" 41	0	1	0.00
"	RUN" 42	0	0	"undef"
"	RUN" 43	0	1	0.00
"	RUN" 44	1	1	100.00
"	AVERAGE"	0.25	0.75	33.33
"Trk	RUN" 41	0	1	0.00
"	RUN" 42	0	0	"undef"
"	RUN" 43	0	1	0.00
"	RUN" 44	0	1	0.00

```
"                    AVERAGE"          0.00          0.75          0.00
"-------------------------------------------------------------------------"
"Trk Ut              RUN" 41              0             1          0.00
"                    RUN" 42              0             0       "undef"
"                    RUN" 43              0             1          0.00
"                    RUN" 44              0             1          0.00
"                    AVERAGE"          0.00          0.75          0.00
"-------------------------------------------------------------------------"
"ZODIAC              RUN" 41              0             1          0.00
"                    RUN" 42              0             0       "undef"
"                    RUN" 43              0             1          0.00
"                    RUN" 44              0             1          0.00
"                    AVERAGE"          0.00          0.75          0.00
"========================================================================="
"END GT(MIN)         RUN" 41     60.32
"                    RUN" 42     59.75
"                    RUN" 43     60.33
"                    RUN" 44     60.30
"                    AVERAGE"    60.17
"========================================================================="
"END GT(MIN)
```

"percon1: PERCENT CONTRIBUTION"
"RUN 24----- SCENARIO 491"

"BLUE SYSTEMS		KILLS BY INDIV SYS	KILLS BY SEL GROUP	PERCENT" CONTRIBUTION"
"TEISSL	RUN" 21	2	6	33.33
"	RUN" 22	2	7	28.57
"	RUN" 23	2	8	25.00
"	RUN" 24	2	10	20.00
"	AVERAGE"	2.00	7.75	25.81
"TEISSS	RUN" 21	1	6	16.67
"	RUN" 22	3	7	42.86
"	RUN" 23	5	8	62.50
"	RUN" 24	6	10	60.00
"	AVERAGE"	3.75	7.75	48.39
"Teiss2	RUN" 21	3	6	50.00
"	RUN" 22	2	7	28.57
"	RUN" 23	1	8	12.50
"	RUN" 24	2	10	20.00
"	AVERAGE"	2.00	7.75	25.81
"UH-60	RUN" 21	0	6	0.00
"	RUN" 22	0	7	0.00
"	RUN" 23	0	8	0.00
"	RUN" 24	0	10	0.00
"	AVERAGE"	0.00	7.75	0.00

"RED SYSTEMS		KILLS BY INDIV SYS	KILLS BY SEL GROUP	PERCENT" CONTRIBUTION"
"CMDR	RUN" 21	0	0	"undef"
"	RUN" 22	0	0	"undef"
"	RUN" 23	0	1	0.00
"	RUN" 24	0	1	0.00
"	AVERAGE"	0.00	0.50	0.00
"LT	RUN" 21	0	0	"undef"
"	RUN" 22	0	0	"undef"
"	RUN" 23	0	1	0.00
"	RUN" 24	0	1	0.00
"	AVERAGE"	0.00	0.50	0.00
"LT MG	RUN" 21	0	0	"undef"
"	RUN" 22	0	0	"undef"
"	RUN" 23	0	1	0.00
"	RUN" 24	0	1	0.00
"	AVERAGE"	0.00	0.50	0.00
"RIFLEM	RUN" 21	0	0	"undef"
"	RUN" 22	0	0	"undef"
"	RUN" 23	1	1	100.00
"	RUN" 24	0	1	0.00
"	AVERAGE"	0.25	0.50	50.00
"SVD	RUN" 21	0	0	"undef"
"	RUN" 22	0	0	"undef"
"	RUN" 23	0	1	0.00
"	RUN" 24	1	1	100.00
"	AVERAGE"	0.25	0.50	50.00
"Trk	RUN" 21	0	0	"undef"
"	RUN" 22	0	0	"undef"
"	RUN" 23	0	1	0.00
"	RUN" 24	0	1	0.00

```
"                    AVERAGE"          0.00          0.50          0.00
"-------------------------------------------------------------------------"
"Trk Ut              RUN" 21              0             0        "undef"
"                    RUN" 22              0             0        "undef"
"                    RUN" 23              0             1          0.00
"                    RUN" 24              0             1          0.00
"                    AVERAGE"          0.00          0.50          0.00
"-------------------------------------------------------------------------"
"ZODIAC              RUN" 21              0             0        "undef"
"                    RUN" 22              0             0        "undef"
"                    RUN" 23              0             1          0.00
"                    RUN" 24              0             1          0.00
"                    AVERAGE"          0.00          0.50          0.00
"========================================================================="
"END GT(MIN)         RUN" 21     60.32
"                    RUN" 22     60.30
"                    RUN" 23     60.32
"                    RUN" 24     60.17
"                    AVERAGE"    60.27
"========================================================================="
"END GT(MIN)
```

"percon1: PERCENT CONTRIBUTION"
"RUN 14-----> SCENARIO 490"

"BLUE SYSTEMS		KILLS BY INDIV SYS	KILLS BY SEL GROUP	PERCENT" CONTRIBUTION"
"CSOL_2	RUN" 11	5	23	21.74
"	RUN" 12	4	23	17.39
"	RUN" 13	4	23	17.39
"	RUN" 14	1	22	4.54
"	AVERAGE"	3.50	22.75	15.38
"CSOL_L	RUN" 11	1	23	4.35
"	RUN" 12	1	23	4.35
"	RUN" 13	2	23	8.70
"	RUN" 14	1	22	4.54
"	AVERAGE"	1.25	22.75	5.49
"CSOL_M	RUN" 11	3	23	13.04
"	RUN" 12	3	23	13.04
"	RUN" 13	5	23	21.74
"	RUN" 14	3	22	13.64
"	AVERAGE"	3.50	22.75	15.38
"CSOL_R	RUN" 11	13	23	56.52
"	RUN" 12	13	23	56.52
"	RUN" 13	9	23	39.13
"	RUN" 14	14	22	63.64
"	AVERAGE"	12.25	22.75	53.85
"CSOL_S	RUN" 11	1	23	4.35
"	RUN" 12	2	23	8.70
"	RUN" 13	3	23	13.04
"	RUN" 14	3	22	13.64
"	AVERAGE"	2.25	22.75	9.89
"UH-60	RUN" 11	0	23	0.00
"	RUN" 12	0	23	0.00
"	RUN" 13	0	23	0.00
"	RUN" 14	0	22	0.00
"	AVERAGE"	0.00	22.75	0.00

"RED SYSTEMS		KILLS BY INDIV SYS	KILLS BY SEL GROUP	PERCENT" CONTRIBUTION"
"CMDR	RUN" 11	0	1	0.00
"	RUN" 12	0	1	0.00
"	RUN" 13	0	0	"undef"
"	RUN" 14	0	0	"undef"
"	AVERAGE"	0.00	0.50	0.00
"LT	RUN" 11	0	1	0.00
"	RUN" 12	0	1	0.00
"	RUN" 13	0	0	"undef"
"	RUN" 14	0	0	"undef"
"	AVERAGE"	0.00	0.50	0.00
"LT MG	RUN" 11	0	1	0.00
"	RUN" 12	0	1	0.00
"	RUN" 13	0	0	"undef"
"	RUN" 14	0	0	"undef"
"	AVERAGE"	0.00	0.50	0.00
"RIFLEM	RUN" 11	1	1	100.00
"	RUN" 12	0	1	0.00
"	RUN" 13	0	0	"undef"
"	RUN" 14	0	0	"undef"

```
"                    AVERAGE"          0.25          0.50          50.00
"-------------------------------------------------------------------------"
"SVD                 RUN" 11              0             1           0.00
"                    RUN" 12              1             1         100.00
"                    RUN" 13              0             0        "undef"
"                    RUN" 14              0             0        "undef"
"                    AVERAGE"          0.25          0.50          50.00
"-------------------------------------------------------------------------"
"Trk                 RUN" 11              0             1           0.00
"                    RUN" 12              0             1           0.00
"                    RUN" 13              0             0        "undef"
"                    RUN" 14              0             0        "undef"
"                    AVERAGE"          0.00          0.50          0.00
"-------------------------------------------------------------------------"
"Trk Ut              RUN" 11              0             1           0.00
"                    RUN" 12              0             1           0.00
"                    RUN" 13              0             0        "undef"
"                    RUN" 14              0             0        "undef"
"                    AVERAGE"          0.00          0.50          0.00
"-------------------------------------------------------------------------"
"ZODIAC              RUN" 11              0             1           0.00
"                    RUN" 12              0             1           0.00
"                    RUN" 13              0             0        "undef"
"                    RUN" 14              0             0        "undef"
"                    AVERAGE"          0.00          0.50          0.00
"========================================================================="
"END GT(MIN)         RUN" 11     77.13
"                    RUN" 12     77.10
"                    RUN" 13     77.12
"                    RUN" 14     77.12
"                    AVERAGE"    77.12
"========================================================================="
"END GT(MIN)
```

"percon1: PERCENT CONTRIBUTION"
"RUN 490---- SCENARIO 490"

"BLUE SYSTEMS		KILLS BY INDIV SYS	KILLS BY SEL GROUP	PERCENT" CONTRIBUTION"
"CSOL_2	RUN" 31	3	23	13.04
"	RUN" 32	4	24	16.67
"	RUN" 33	0	24	0.00
"	RUN" 34	0	23	0.00
"	AVERAGE"	1.75	23.50	7.45
"CSOL_L	RUN" 31	4	23	17.39
"	RUN" 32	1	24	4.17
"	RUN" 33	0	24	0.00
"	RUN" 34	1	23	4.35
"	AVERAGE"	1.50	23.50	6.38
"CSOL_M	RUN" 31	4	23	17.39
"	RUN" 32	7	24	29.17
"	RUN" 33	7	24	29.17
"	RUN" 34	6	23	26.09
"	AVERAGE"	6.00	23.50	25.53
"CSOL_R	RUN" 31	8	23	34.78
"	RUN" 32	6	24	25.00
"	RUN" 33	12	24	50.00
"	RUN" 34	10	23	43.48
"	AVERAGE"	9.00	23.50	38.30
"CSOL_S	RUN" 31	4	23	17.39
"	RUN" 32	6	24	25.00
"	RUN" 33	5	24	20.83
"	RUN" 34	6	23	26.09
"	AVERAGE"	5.25	23.50	22.34
"UH-60	RUN" 31	0	23	0.00
"	RUN" 32	0	24	0.00
"	RUN" 33	0	24	0.00
"	RUN" 34	0	23	0.00
"	AVERAGE"	0.00	23.50	0.00

"RED SYSTEMS		KILLS BY INDIV SYS	KILLS BY SEL GROUP	PERCENT" CONTRIBUTION"
"CMDR	RUN" 31	0	1	0.00
"	RUN" 32	0	2	0.00
"	RUN" 33	0	0	"undef"
"	RUN" 34	0	0	"undef"
"	AVERAGE"	0.00	0.75	0.00
"LT	RUN" 31	0	1	0.00
"	RUN" 32	0	2	0.00
"	RUN" 33	0	0	"undef"
"	RUN" 34	0	0	"undef"
"	AVERAGE"	0.00	0.75	0.00
"LT MG	RUN" 31	0	1	0.00
"	RUN" 32	0	2	0.00
"	RUN" 33	0	0	"undef"
"	RUN" 34	0	0	"undef"
"	AVERAGE"	0.00	0.75	0.00
"RIFLEM	RUN" 31	1	1	100.00
"	RUN" 32	1	2	50.00
"	RUN" 33	0	0	"undef"
"	RUN" 34	0	0	"undef"

"	AVERAGE"	0.50	0.75	66.67
"----------	----------	----------	----------	----------
"SVD	RUN" 31	0	1	0.00
"	RUN" 32	1	2	50.00
"	RUN" 33	0	0	"undef"
"	RUN" 34	0	0	"undef"
"	AVERAGE"	0.25	0.75	33.33
"----------	----------	----------	----------	----------
"Trk	RUN" 31	0	1	0.00
"	RUN" 32	0	2	0.00
"	RUN" 33	0	0	"undef"
"	RUN" 34	0	0	"undef"
"	AVERAGE"	0.00	0.75	0.00
"----------	----------	----------	----------	----------
"Trk Ut	RUN" 31	0	1	0.00
"	RUN" 32	0	2	0.00
"	RUN" 33	0	0	"undef"
"	RUN" 34	0	0	"undef"
"	AVERAGE"	0.00	0.75	0.00
"----------	----------	----------	----------	----------
"ZODIAC	RUN" 31	0	1	0.00
"	RUN" 32	0	2	0.00
"	RUN" 33	0	0	"undef"
"	RUN" 34	0	0	"undef"
"	AVERAGE"	0.00	0.75	0.00
"==========	==========	==========	==========	==========
"END GT(MIN)	RUN" 31	77.12		
"	RUN" 32	77.12		
"	RUN" 33	77.12		
"	RUN" 34	77.13		
"	AVERAGE"	77.12		
"==========	==========	==========	==========	==========
"END GT(MIN)				

Enclosure 11

JEDA Output for Phase II Simulations

"detect1: DETECTION RATIO"
" ALL BLUE"
"-VS-   ALL RED"
"RUN 11----- SCENARIO 490"

"RUN	BLUE DETECTS RED	RED DETECTS BLUE	DETECTION RATIO	END GT"
11	349	68	5.13	77.13
12	370	64	5.78	77.10
13	369	61	6.05	77.12
14	362	55	6.58	77.12
"AVG"	362.50	62.00	5.85	77.12

"dfkch1: DETECT/FIRE/KILL TOTALS CHART"
" ALL BLUE"
"-VS-   ALL RED"
"RUN 11----- Scenario 490 RUN"

	11	12	13	14
"TOTAL"				
"DETECTS"	349.00	370.00	369.00	362.00
"FIRES"	503.00	398.00	389.00	500.00
"KILLS"	23	23	23	22

"dfktal: DETECT/FIRE/KILL AVERAGES"
" ALL BLUE"
"-VS- ALL RED"
"RUN 11----- SCENARIO 490"

	DETECTS	FIRINGS		KILLS			AVERAGE RANGES				
							DETECT	FIRINGS	KILLS		
RUN		DF	IF	DF	IF	MINE		DF only	DF	IF	EN
11	349	503	0	23	0	0	1.550	0.912	0.623	0.000	7
12	370	398	0	23	0	0	1.523	0.913	0.630	0.000	7
13	369	389	0	23	0	0	1.542	0.924	0.646	0.000	7
14	362	500	0	22	0	0	1.509	0.941	0.589	0.000	7
TOT	1450	1790	0	91	0	0					
AVG	362.5	447.5	0.0	22.8	0.0	0.0	1.531	0.923	0.622	0.000	7
SDV	9.7	62.5	0.0	0.5	0.0	0.0	0.018	0.014	0.024	0.000	
"95% CONFIDENCE INTERVALS (NORMAL DISTRIBUTION)"											
LOW	343.5	325.0	0.0	21.8	0.0	0.0	1.494	0.896	0.575	0.000	7
UPP	381.5	569.9	0.0	23.7	0.0	0.0	1.567	0.950	0.669	0.000	7

"ferl: FORCE EXCHANGE RATIO"
" ALL BLUE"
"-VS- ALL RED"
"RUN 11----- SCENARIO 490"

"RUN	RED LOSSES	BLUE" LOSSES	LER	INIT RED	INIT BLUE	IFR	FER	ENI
11	23	1	23.00	28	36	0.78	29.57	77.13
12	23	1	23.00	28	36	0.78	29.57	77.10
13	23	0	0.00	28	36	0.78	0.00	77.12
14	22	0	0.00	28	36	0.78	0.00	77.12
"AVG"	22.75	0.50	15.50	28	36	0.78	58.50	77.12

```
"indf1:  INDIRECT FIRE REPORT"
"SELECTED BLUE SYSTEMS"
"-VS-   ALL RED"
"RUN 11----- SCENARIO 490"
"=============================================================================="
"AVERAGE OVER ALL RUNS SELECTED"
"=============================================================================="
"                                          ROUNDS    MUNITION MUNITION"
"       SYSTEM MUNITION  ROUNDS  KILLS    PER KILL   USAGE    CONTRIB  ENDGT"
"------------------------------------------------------------------------------"
"                                                                        "77.12
"=============================================================================="
"INDIVIDUAL RUN STATISTICS"
"=============================================================================="
"RUN" 11"                                                                "77.13
"------------------------------------------------------------------------------"
"RUN" 12"                                                                "77.10
"------------------------------------------------------------------------------"
"RUN" 13"                                                                "77.12
"------------------------------------------------------------------------------"
"RUN" 14"                                                                "77.12
"==============================================================================
```

"kpersel: KILLS PER SYSTEM EMPLOYED"
"RUN 14----- SCENARIO 490"
"

"BLUE SYSTEMS		KILLS BY	NUMBER EMPLOYED	KILLS PER" SYSTEM EMPLOYED"
"ALL BLUE	RUN" 11	23	36	0.64
"	RUN" 12	23	36	0.64
"	RUN" 13	23	36	0.64
"	RUN" 14	22	36	0.61
"	AVERAGE"	22.75	36	0.63

"

"RED SYSTEMS		KILLS BY	NUMBER EMPLOYED	KILLS PER" SYSTEM EMPLOYED"
"ALL RED	RUN" 11	1	28	0.04
"	RUN" 12	1	28	0.04
"	RUN" 13	0	28	0.00
"	RUN" 14	0	28	0.00
"	AVERAGE"	0.50	28	0.02

"END GT(MIN)	RUN" 11	77.13
"	RUN" 12	77.10
"	RUN" 13	77.12
"	RUN" 14	77.12
"	AVERAGE"	77.12

"range1: DETECT/FIRE/KILL RANGE HISTOGRAM"
" ALL BLUE"
"-VS- ALL RED"

"RANGE(KM)in: RUN 11----- Scenario 490 Run:"						11RUN 12----- Scenario 490 Run			
0.00	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88	0.99	1
"AVERAGE"										
"DETECTS"	0.2	0.5	0.5	0.5	0.5	3.8	5.0	14.5	36.2	3
"FIRES"	0.0	0.0	0.0	8.0	29.5	14.5	9.0	34.8	169.2	18
"KILLS"	0.0	0.0	0.0	2.5	7.8	4.2	4.8	1.2	0.8	

"ser1: SYSTEM EXCHANGE RATIO"
"RUN 14----- SCENARIO 490"

"BLUE SYSTEMS		KILLS BY	KILLS OF	SER"
"ALL BLUE	RUN" 11	23	1	23.00
"	RUN" 12	23	1	23.00
"	RUN" 13	23	0	"undef"
"	RUN" 14	22	0	"undef"
"	AVERAGE"	22.75	0.50	45.50

"RED SYSTEMS		KILLS BY	KILLS OF	SER"
"ALL RED	RUN" 11	1	23	0.04
"	RUN" 12	1	23	0.04
"	RUN" 13	0	23	0.00
"	RUN" 14	0	22	0.00
"	AVERAGE"	0.50	22.75	0.02

"END GT(MIN)	RUN" 11	77.13
"	RUN" 12	77.10
"	RUN" 13	77.12
"	RUN" 14	77.12
"	AVERAGE"	77.12

"time1: DETECT/FIRE/KILL TIME HISTOGRAM"
" : ALL BLUE"
"-VS- ALL RED"
"TIME(MIN)in: RUN 11----- Scenario 490 Run:" 11RUN 12----- Scenario 490 Run

0.00	8.00	16.00	24.00	32.00	40.00	48.00	56.00	64.00	72.00	80
"AVERAGE"										
"DETECTS"	1.8	0.0	0.0	0.0	2.5	60.2	31.8	125.5	64.2	7
"FIRES"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44
"KILLS"	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2

"time rng1: TIME VS RANGE VS DFK"
" ALL BLUE"
"-VS-   ALL RED"
"RUN 11----- Scenario 490 Run:" 11"RUN 12----- Scenario 490 Run:" 12"RUN 13

TIME (MIN)	DETECTIONS: MEAN RANGE	DETECTIONS: AVERAGE DETECTS	DF & IF FIRES: MEAN DF RANGE	DF & IF FIRES: AVG # DIRECT	DF & IF FIRES: AVG # INDIR	DF & IF KILLS: MEAN DF RANGE	DF & IF KILLS: AVG # DIRECT	DF & IF KILLS: MEAN IF RANGE	AV IN
0.00	0.41	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
32.00	2.21	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0
40.00	2.14	60.25	0.00	0.00	0.00	0.00	0.00	0.00	0
48.00	1.94	31.75	0.00	0.00	0.00	0.00	0.00	0.00	0
56.00	1.65	125.50	0.00	0.00	0.00	0.00	0.00	0.00	0
64.00	1.05	64.25	0.00	0.00	0.00	0.00	0.00	0.00	0
72.00	1.10	76.50	0.92	447.50	0.00	0.62	22.75	0.00	0
80.00									

"csu1: COMBAT SYSTEM UTILIZATION"
"RUN 490---- SCENARIO 490"

BLUE SYSTEMS		PERCENT CONTRIB	INITIAL STRENGTHS INDIV SYS	SEL GROUP	PERCENT OF GROUP	CSU
CSOL_2	RUN 31	13.04	6	36	16.67	0.78
	RUN 32	16.67	6	36	16.67	1.00
	RUN 33	0.00	6	36	16.67	0.00
	RUN 34	0.00	6	36	16.67	0.00
	AVERAGE	7.45	6	36	16.67	0.44
CSOL_L	RUN 31	17.39	2	36	5.56	3.13
	RUN 32	4.17	2	36	5.56	0.75
	RUN 33	0.00	2	36	5.56	0.00
	RUN 34	4.35	2	36	5.56	0.78
	AVERAGE	6.38	2	36	5.56	1.16
CSOL_M	RUN 31	17.39	2	36	5.56	3.13
	RUN 32	29.17	2	36	5.56	5.25
	RUN 33	29.17	2	36	5.56	5.25
	RUN 34	26.09	2	36	5.56	4.70
	AVERAGE	25.53	2	36	5.56	4.58
CSOL_R	RUN 31	34.78	16	36	44.44	0.78
	RUN 32	25.00	16	36	44.44	0.56
	RUN 33	50.00	16	36	44.44	1.12
	RUN 34	43.48	16	36	44.44	0.98
	AVERAGE	38.30	16	36	44.44	0.86
CSOL_S	RUN 31	17.39	6	36	16.67	1.04
	RUN 32	25.00	6	36	16.67	1.50
	RUN 33	20.83	6	36	16.67	1.25
	RUN 34	26.09	6	36	16.67	1.56
	AVERAGE	22.34	6	36	16.67	1.34
UH-60	RUN 31	0.00	4	36	11.11	0.00
	RUN 32	0.00	4	36	11.11	0.00
	RUN 33	0.00	4	36	11.11	0.00
	RUN 34	0.00	4	36	11.11	0.00
	AVERAGE	0.00	4	36	11.11	0.00

RED SYSTEMS		PERCENT CONTRIB	INITIAL STRENGTHS INDIV SYS	SEL GROUP	PERCENT OF GROUP	CSU
CMDR	RUN 31	0.00	2	28	7.14	0.00
	RUN 32	0.00	2	28	7.14	0.00
	RUN 33	"undef"	2	28	7.14	"undef"
	RUN 34	"undef"	2	28	7.14	"undef"
	AVERAGE	0.00	2	28	7.14	0.00
LT	RUN 31	0.00	8	28	28.57	0.00
	RUN 32	0.00	8	28	28.57	0.00
	RUN 33	"undef"	8	28	28.57	"undef"
	RUN 34	"undef"	8	28	28.57	"undef"
	AVERAGE	0.00	8	28	28.57	0.00
LT MG	RUN 31	0.00	0	28	0.00	"undef"
	RUN 32	0.00	0	28	0.00	"undef"
	RUN 33	"undef"	0	28	0.00	"undef"
	RUN 34	"undef"	0	28	0.00	"undef"
	AVERAGE	0.00	0	28	0.00	0.00
RIFLEM	RUN 31	100.00	11	28	39.28	2.54
	RUN 32	50.00	11	28	39.28	1.27

"	RUN" 33	"undef"	11	28	39.28	"undef"
"	RUN" 34	"undef"	11	28	39.28	"undef"
"	AVERAGE"	66.67	11	28	39.28	0.95
"SVD	RUN" 31	0.00	4	28	14.28	0.0
"	RUN" 32	50.00	4	28	14.28	3.5
"	RUN" 33	"undef"	4	28	14.28	"undef"
"	RUN" 34	"undef"	4	28	14.28	"undef"
"	AVERAGE"	33.33	4	28	14.28	0.88
"Trk	RUN" 31	0.00	2	28	7.14	0.00
"	RUN" 32	0.00	2	28	7.14	0.00
"	RUN" 33	"undef"	2	28	7.14	"undef"
"	RUN" 34	"undef"	2	28	7.14	"undef"
"	AVERAGE"	0.00	2	28	7.14	0.00
"Trk Ut	RUN" 31	0.00	0	28	0.00	"undef"
"	RUN" 32	0.00	0	28	0.00	"undef"
"	RUN" 33	"undef"	0	28	0.00	"undef"
"	RUN" 34	"undef"	0	28	0.00	"undef"
"	AVERAGE"	0.00	0	28	0.00	0.00
"ZODIAC	RUN" 31	0.00	1	28	3.57	0.00
"	RUN" 32	0.00	1	28	3.57	0.00
"	RUN" 33	"undef"	1	28	3.57	"undef"
"	RUN" 34	"undef"	1	28	3.57	"undef"
"	AVERAGE"	0.00	1	28	3.57	0.00

"detect1: DETECTION RATIO"
" ALL BLUE"
"-VS-   ALL RED"
"RUN 31----- SCENARIO 490"

"RUN	BLUE DETECTS RED	RED DETECTS BLUE	DETECTION" RATIO	END GT"
31	369	129	2.86	77.12
32	374	119	3.14	77.12
33	370	127	2.91	77.12
34	381	98	3.89	77.13
"AVG"	373.50	118.25	3.16	77.12

"dfkch1: DETECT/FIRE/KILL TOTALS CHART"
" ALL BLUE"
"-VS-   ALL RED"
"RUN 31----- Scenario 490 RUN"

	31	32	33	34
"TOTAL"				
"DETECTS"	369.00	374.00	370.00	381.00
"FIRES"	470.00	429.00	541.00	534.00
"KILLS"	23	24	24	23

"dfktal: DETECT/FIRE/KILL AVERAGES"
" ALL BLUE"
"-VS- ALL RED"
"RUN 31----- SCENARIO 490"

	DETECTS	FIRINGS		KILLS			AVERAGE RANGES				
							DETECT	FIRINGS	KILLS		
RUN		DF	IF	DF	IF	MINE		DF only	DF	IF	EN
31	369	470	0	23	0	0	1.502	0.806	0.628	0.000	7
32	374	429	0	24	0	0	1.488	0.722	0.652	0.000	7
33	370	541	0	24	0	0	1.523	0.818	0.634	0.000	7
34	381	534	0	23	0	0	1.464	0.839	0.622	0.000	7
TOT	1494	1974	0	94	0	0					
AVG	373.5	493.5	0.0	23.5	0.0	0.0	1.494	0.800	0.634	0.000	7
SDV	5.4	53.6	0.0	0.6	0.0	0.0	0.025	0.052	0.013	0.000	
"95% CONFIDENCE INTERVALS (NORMAL DISTRIBUTION)"											
LOW	362.8	388.5	0.0	22.4	0.0	0.0	1.445	0.699	0.609	0.000	7
UPP	384.2	598.5	0.0	24.6	0.0	0.0	1.543	0.901	0.659	0.000	7

"ferl: FORCE EXCHANGE RATIO"
" ALL BLUE"
"-VS- ALL RED"
"RUN 31----- SCENARIO 490"

"RUN	RED LOSSES	BLUE LOSSES	LER	INIT RED	INIT BLUE	IFR	FER	EN
31	23	1	23.00	28	36	0.78	29.57	77.12
32	24	2	12.00	28	36	0.78	15.43	77.12
33	24	0	0.00	28	36	0.78	0.00	77.12
34	23	0	0.00	28	36	0.78	0.00	77.13
"AVG"	23.50	0.75	31.33	28	36	0.78	40.28	77.12

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The Enhanced Integrated Soldier System on Janus Army

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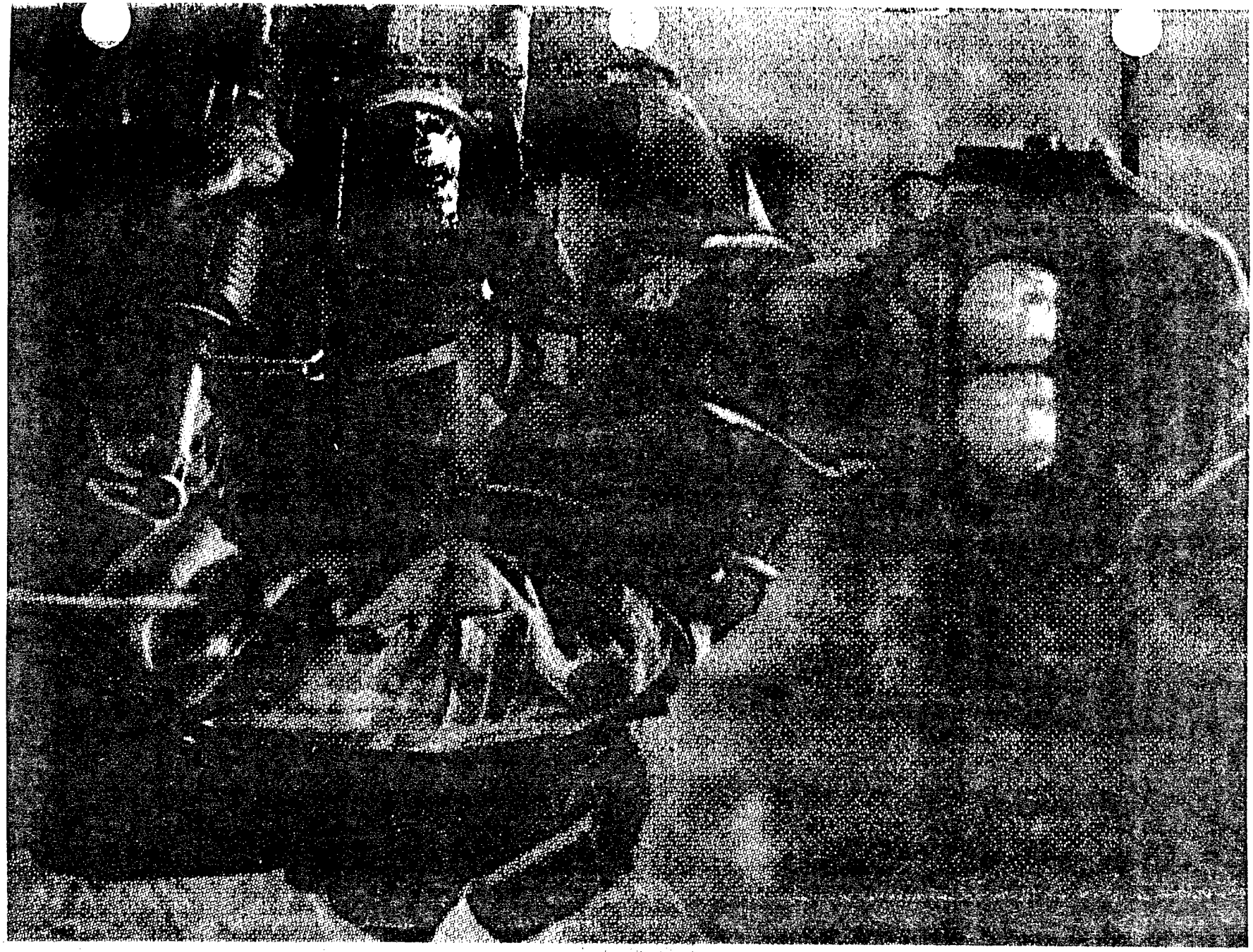
Laboratory Projects

1. The Future Main Battle Tank (SE403A)
2. The Future Light Helicopter (SE403A)
3. The Enhanced Infantry Soldier System (SE489)
4. The Warfighting Value of Reconnaissance (SE489)
5. Historical Reenactments of (SE489):
   The Battle of Gettysburg
   The Fight for West Point (circa 1775)
6. Combat Modeling and Simulation Textbook (SE489)



TEISS
(The Enhanced Integrated Soldier System)

Agenda:

Purpose

Phase I - Equivalency
- Problem Statement
- Methodology
- MOE
- Scenario Explanation
- Results

Phase II - Validation of Phase I Results/Futuristic Weapons
- Problem Statement
- Methodology
- MOE
- Scenario Explanation
- Results

TEISS
(The Enhanced Integrated Soldier System)

Purpose:

To present the final results of our preliminary analysis conducted on the proposed TEISS soldier.

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Problem Statement - Phase I :

To perform equivalency testing on the TEISS soldier to determine:

The number of TEISS soldiers that could replace an infantry platoon of conventional soldiers.

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Result:

13 TEISS soldiers (engaged in combat) equal the lethality and survivability of a conventional Infantry platoon (30 soldiers engaged in combat).

TEISS
(The Enhanced Integrated Soldier System)

Methodology:

I. Communicate with client - PM Soldier
II. Research
- Database in Janus (A)
- Accurate Tactics
- Previous Research of other Agencies:
  - White Sands Missile Range
  - Dismounted Battle Laboratory
  - ARDEC
  - Natick Labs

III. Drafted Raid Scenario
IV. Modeled TEISS in Janus(A)
V. Ran Simulations with
- Conventional Platoon (34/30)
- Low-end TEISS (7/5)
- High-end TEISS (20/16)

VI. Analyzed results

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MOE Chosen for Equivalency Determination:

I. Mission Time
Direct measure of interactive weapon lethality

II. Survival Percentage
Reveals level of survival and offensive capability

TEISS
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Scenario:

- Central American Terrain
- Raid Scenario
- Drug Processing Plant with 10 Drug Lord Henchmen
- Based on Operation "Blast Furnace"

TEISS
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Results:

- 13 TEISS equal a 30 man conventional platoon
- Additional Runs at 13 TEISS showed MOE improvement that would reduce the number of TEISS to equal the conventional platoon.
- Scenario dependent

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Problem Statement - Phase II :

To perform weapon testing and trade-off analysis on the track box sight for the M16A2 rifle and the OICW (Objective Infantry Combat Weapon) and determine which weapon is preferred.

TEISS
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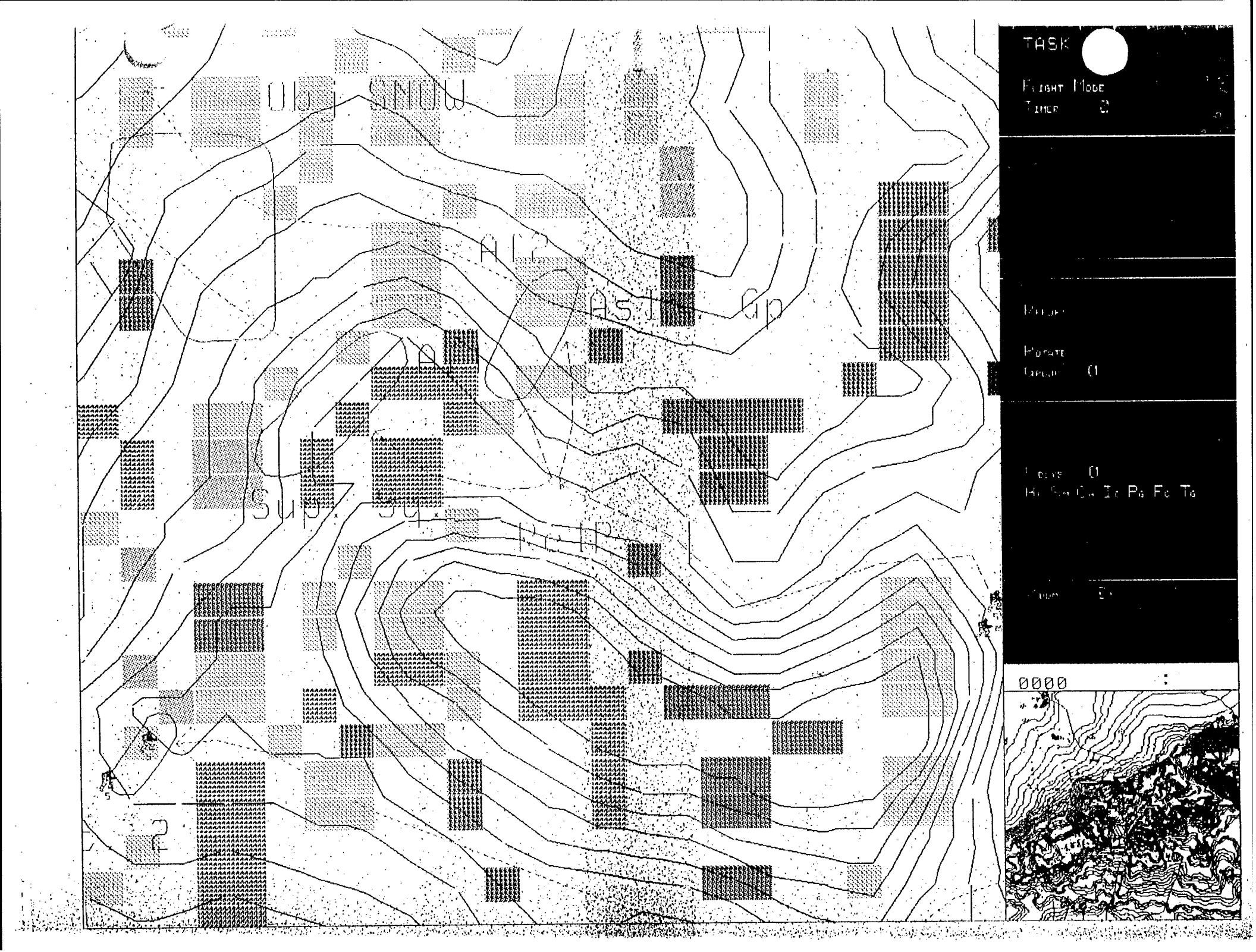
Results :

- Factorial analysis reveals that 13 TEISS soldiers may not equal the conventional platoon.
- The OICW seems to be a more effective weapon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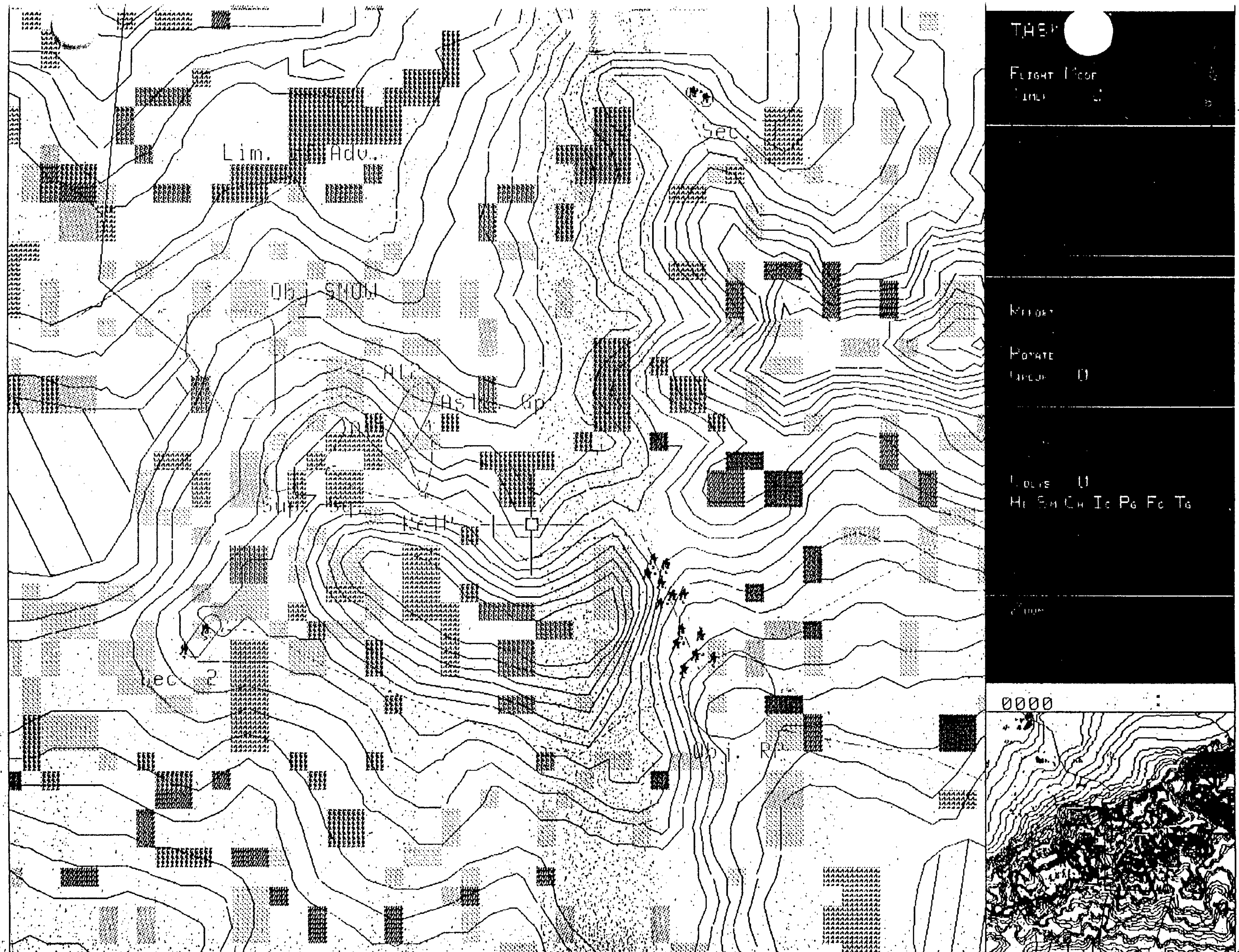

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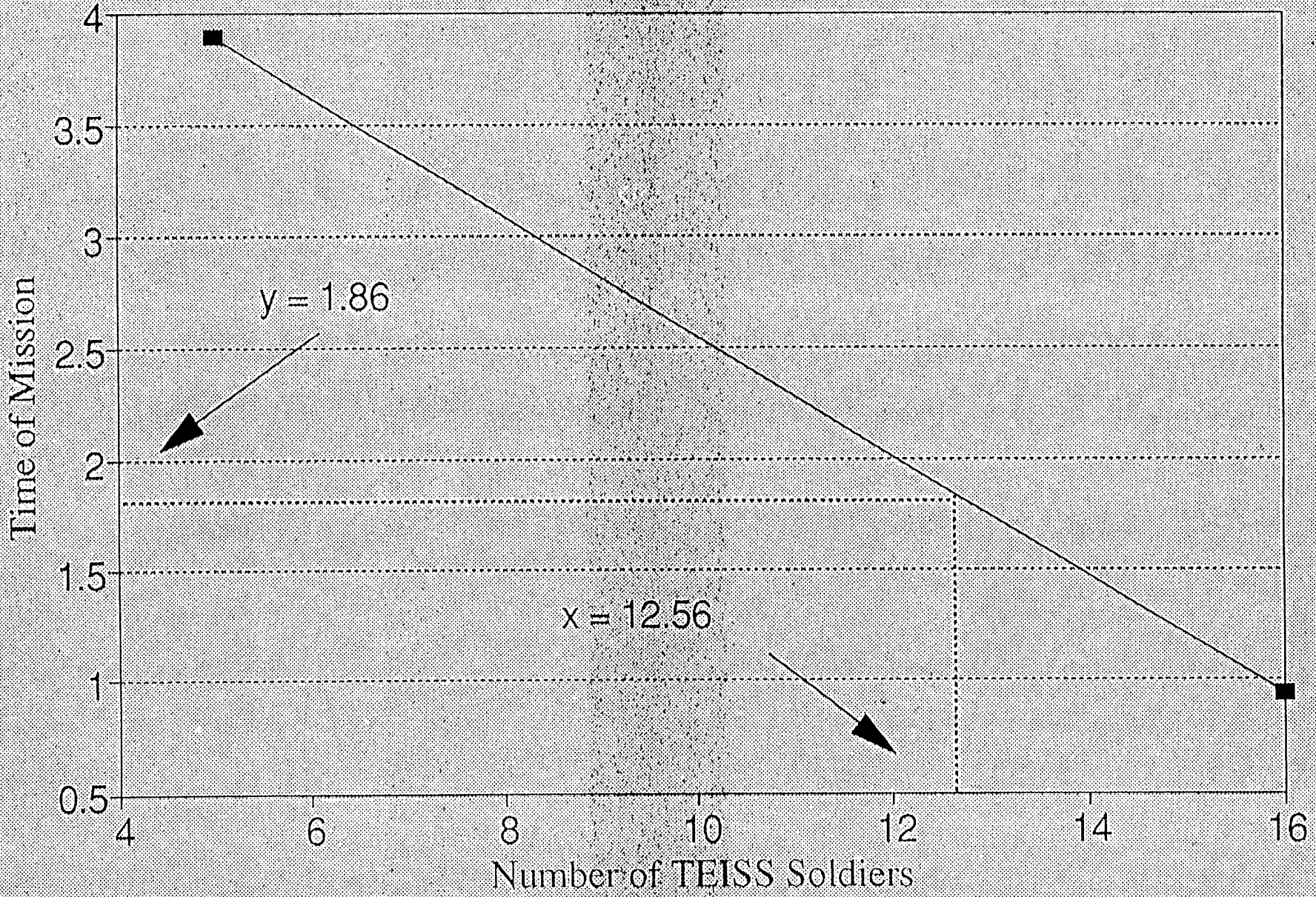
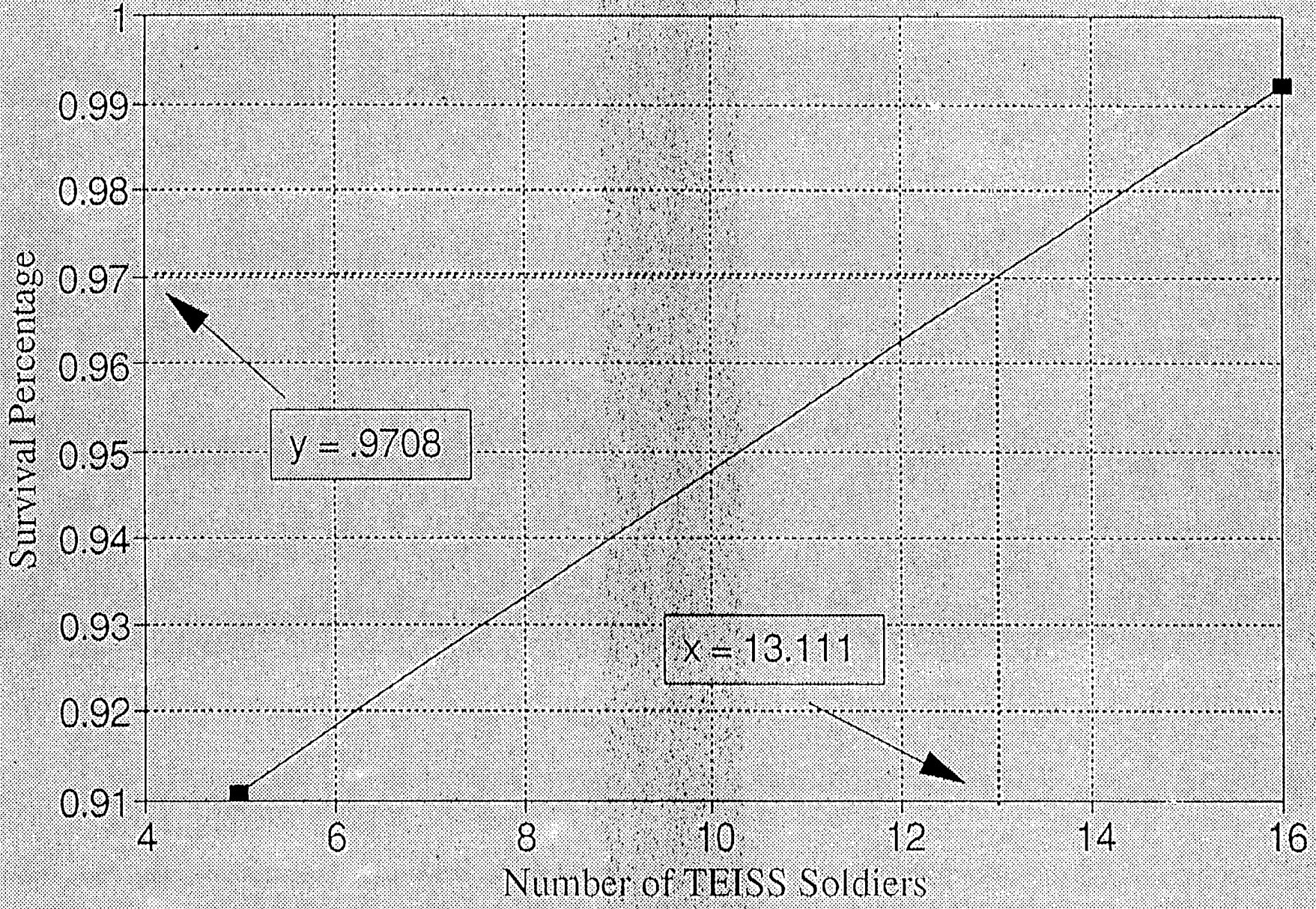
MOE - Time of Mission



MOE - Survival Percentage



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Methodology:

I. Built new and expanded scenario based on Phase I lessons learned.

II. Used a full factorial design (2 factors, 2 levels)

III. Ran Janus(A) Simulations
- First Factor - Primary weapon system used
  - High - OICW
  - Low - Track box sight
- Second Factor - Force type
  - High - TEISS
  - Low - Conventional

VI. Analyzed results

TEISS
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MOE:

I. Average Enemy Loss
- Effectiveness of weapon system

II. Detection Ratio
- Force type equivalency
- Evaluate technology

III. 1/(Friendly Rounds/Enemy Killed/Friendly Systems Involved)
- Force equivalency
- Weapon efficiency

IV. Average Engagement Range
- Force type equivalency
- Evaluate technology

V. Number of Detections
- Force type equivalency

VI. Average Range to Kill
- Weapon effectiveness

VII. Percent Contribution
- Force equivalence

TEISS
(The Enhanced Integrated Soldier System)

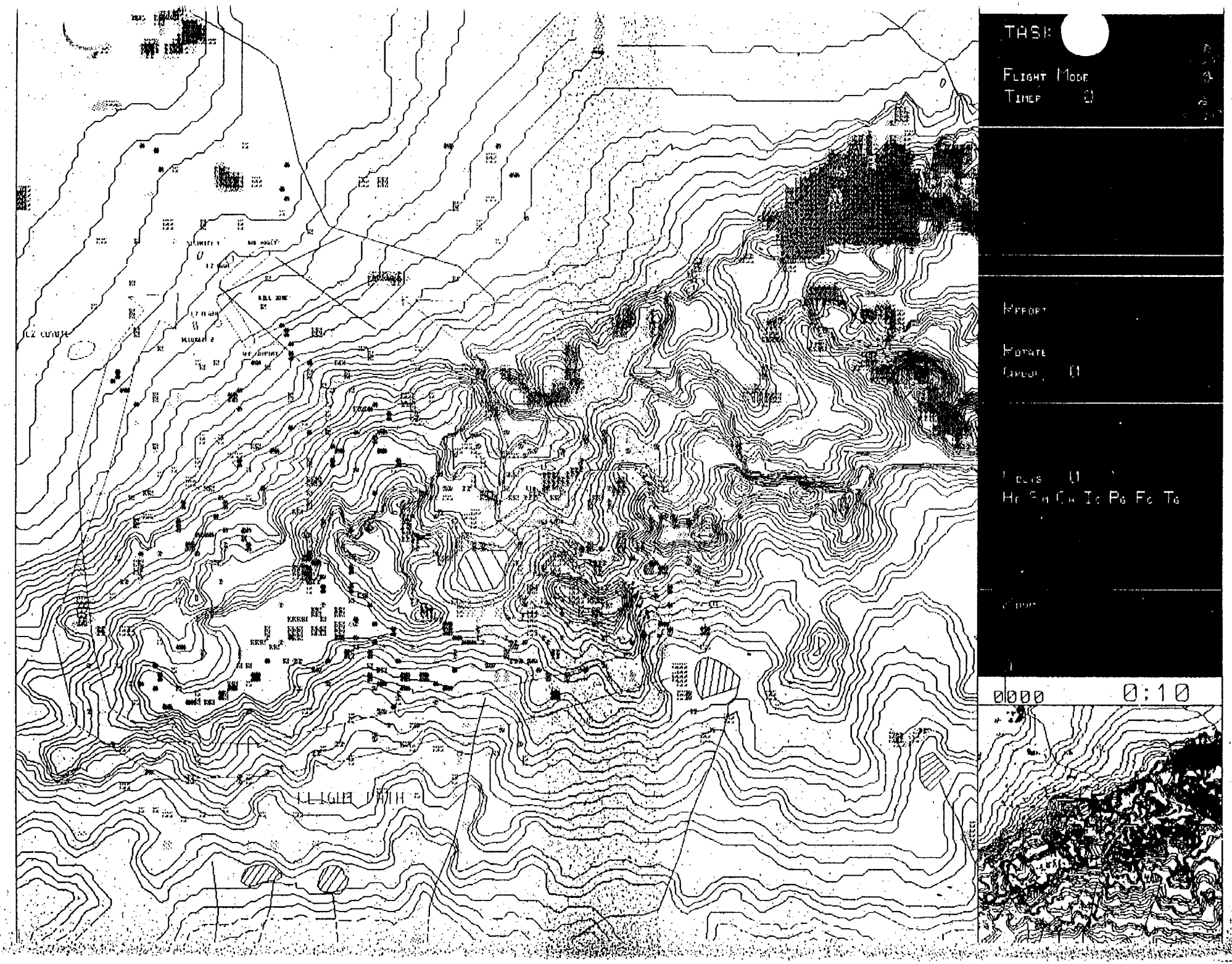
Scenario:

- Central American Terrain
- Ambush Scenario
- Open Terrain - *Far Ambush* with 25 drug lord henchmen

TEISS
(The Enhanced Integrated Soldier System)

Results:

- Factorial analysis reveals that 13 TEISS soldiers may not equal the conventional platoon.
- Achieved high level of significance in all MOE (80% CI) reducing the possibility of type I error. In this experiment, the type 1 error would be that 13 TEISS really do equal a Conventional Rfl Platoon.
- The OICW seems to be a more effective weapon
- Counter Intuitive Results
  - Conventional Platoon Dominated
  - Equivalency number not validated with this scenario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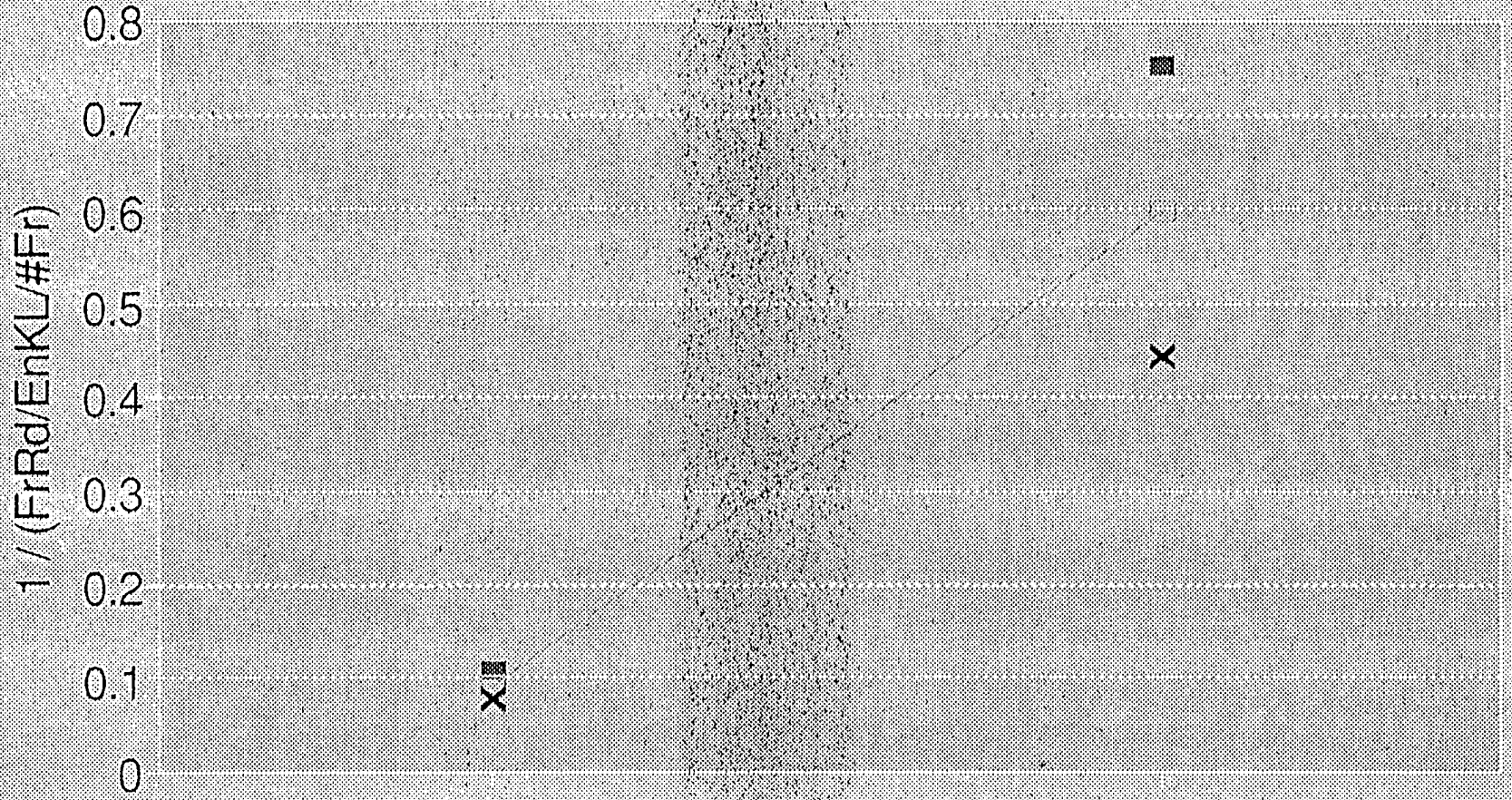
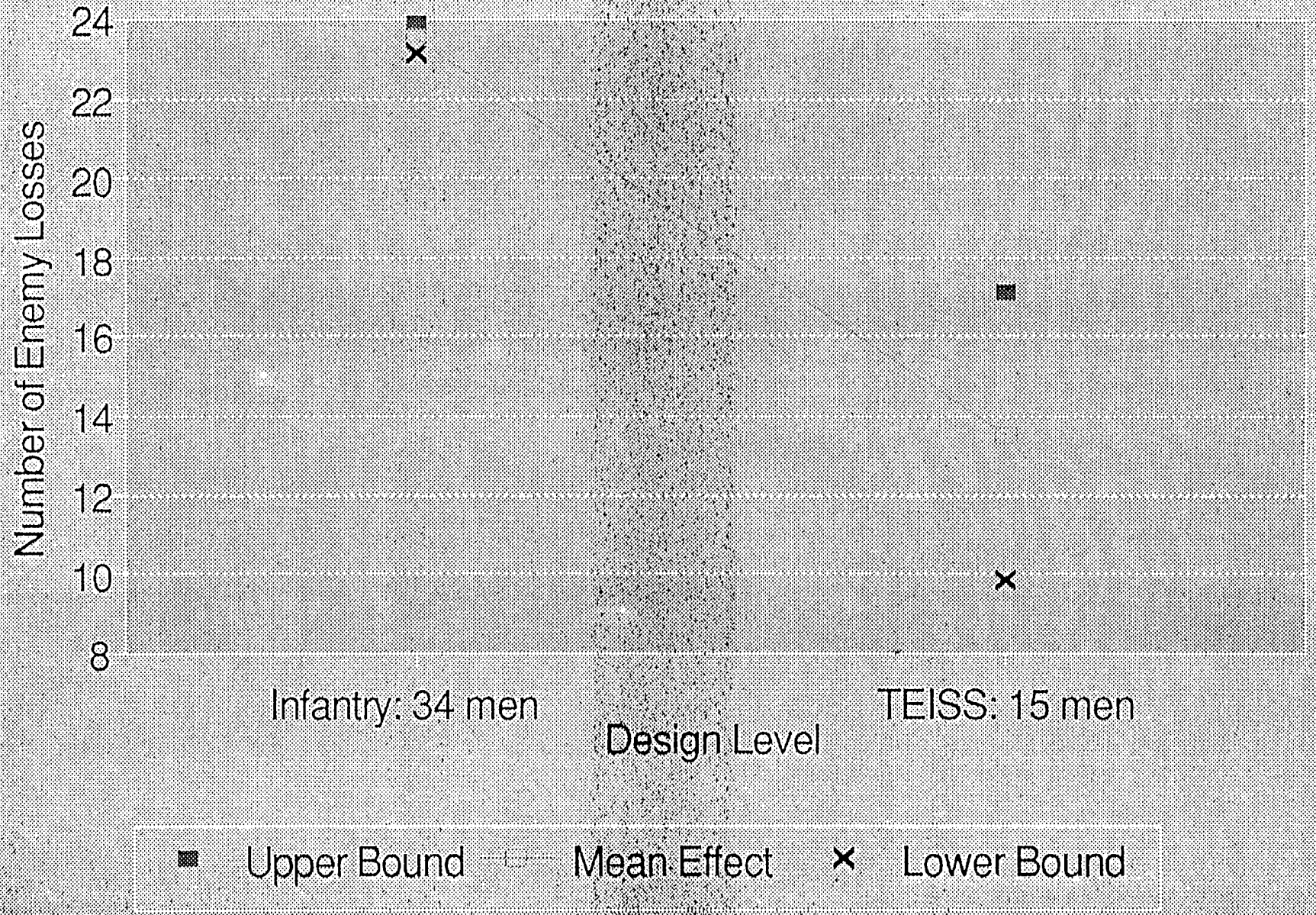
MOE #3 - 1 / (Friendly Rounds / Enemy Killed /

Weapon: DP 2 & 4 (Force Set High)



MOE #1 - Average Enemy Losses

Force: DP 3 & 4 (Weapon Set High)



TEISS
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Lessons Learned:

- Lack of M60 MG in TEISS element reduced firepower significantly. We did not anticipate this prior.
- We gave the same ntelligence advantage to conventional force. This was not realistic.
- Human factors significantly affected MOE responses in unpredicted ways:
  - Reload Times
  - "more eyes on the objective"
- Tactics
  - Conventional soldiers given advantage
  - Effective range discrepancies

TEISS
(The Enhanced Integrated Soldier System)

Recommendations:

- Expand development of TEISS tactics. Obviously, this will affect the scenario play and could affect simulation responses used to calculate equivalency of force.
- Include existing heavy weapons in TEISS force.
- Simulate TEISS in other environments (SWA, ROK) conducting other METL tasks of the infantry platoon.